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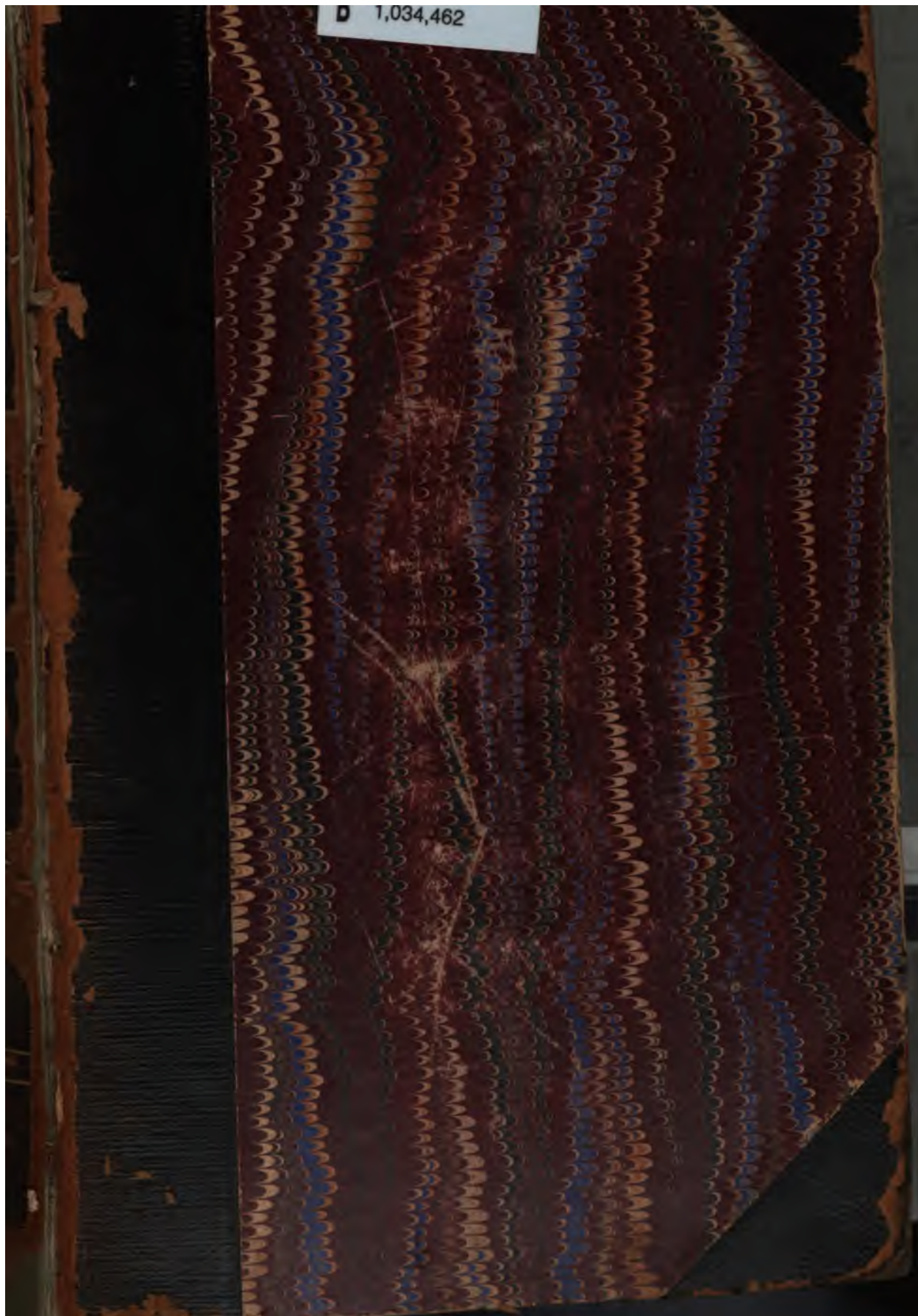
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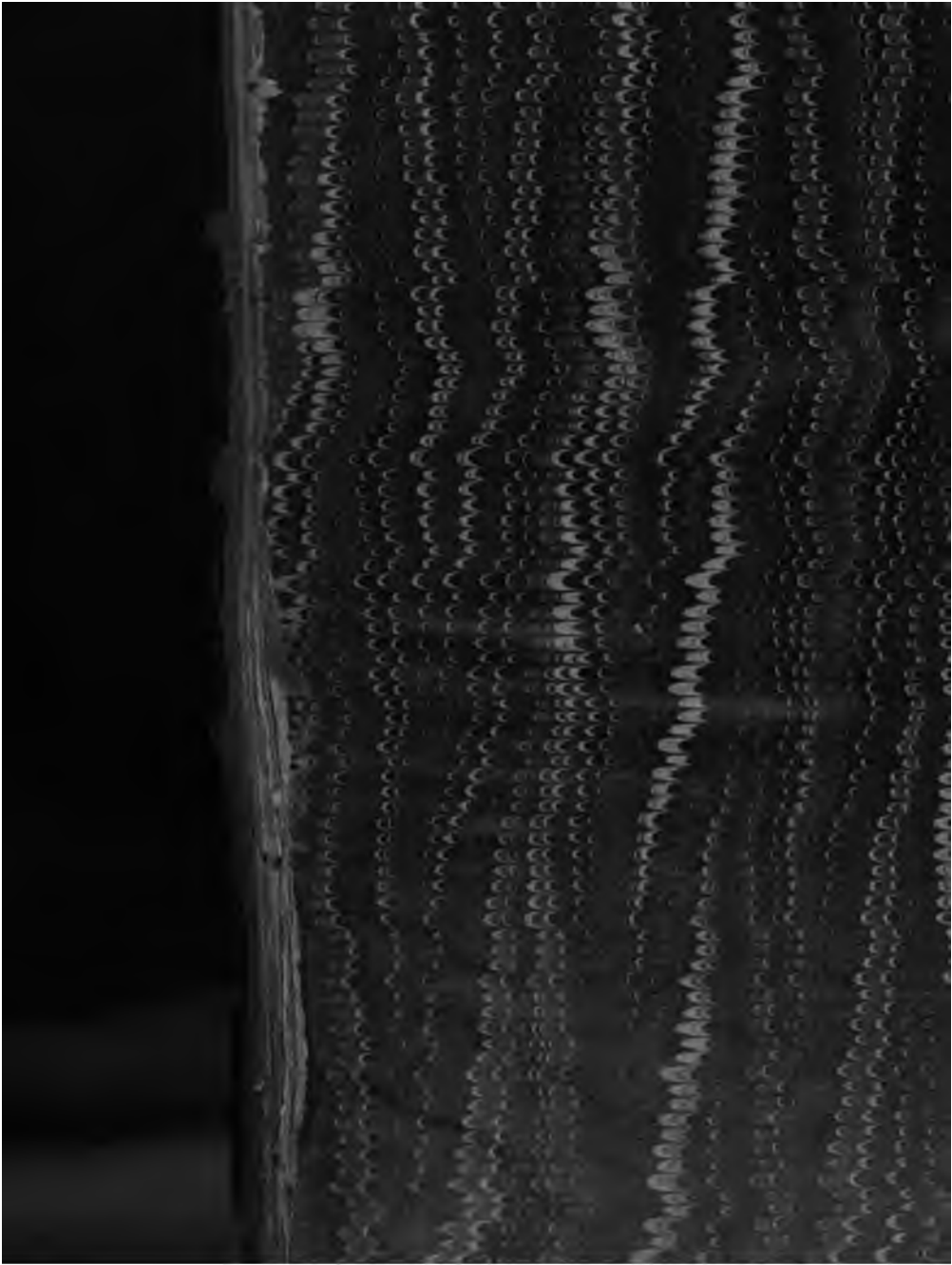
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**ANNUAL REPORTS**

**OF THE**

**WAR DEPARTMENT**

**FOR THE**

**FISCAL YEAR ENDED JUNE 30, 1903.**

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**VOLUME X.**

**REPORT OF THE CHIEF OF ENGINEERS.**

**PART 2.**

---

**WASHINGTON:**  
**GOVERNMENT PRINTING OFFICE.**  
**1903.**





# ARRANGEMENT OF THE ANNUAL REPORTS OF THE WAR DEPARTMENT FOR THE YEAR ENDED JUNE 30, 1903.

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**Volume I.—Secretary of War:**

Chief of Staff.  
Adjutant-General.  
Inspector-General.  
Judge-Advocate-General.

**Volume II.—Armament, Transportation and Supply:**

Quartermaster-General.  
Commissary-General.  
Surgeon-General.  
Paymaster-General.  
Chief of Engineers, Military Affairs.  
Chief of Ordnance.  
Chief Signal Officer.  
Chief of Artillery.  
Board of Ordnance and Fortification.

**Volume III.—Department and Division Commanders:**

Department of California.  
Department of the Colorado.  
Department of the Columbia.  
Department of Dakota.  
Department of the East.  
Department of the Lakes.  
Department of the Missouri.  
Department of Texas.  
Division of the Philippines—  
1. Department of Luzon.  
2. Department of the Visayas.  
3. Department of Mindanao.

**Volume IV.—Military Schools and Colleges; Record and Pension Office;  
Military Parks, and Soldiers' Homes:**

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1. Board of Visitors.  
2. Superintendent.  
Army War College.  
General Service and Staff College.  
School of Application for Cavalry and Field Artillery.  
Artillery School.  
School of Submarine Defense.  
Chief of Record and Pension Office.  
Commissioners of National Military Parks—  
1. Chickamauga and Chattanooga.  
2. Gettysburg.  
3. Shiloh.  
4. Vicksburg.  
Soldiers' Home, District of Columbia—  
1. Board of Commissioners.  
2. Inspection of.  
Inspection of National Home for Disabled Volunteer Soldiers.

**Volumes V-VIII.—Reports of the Philippine Commission, the Chief of  
Bureau of Insular Affairs, and Acts of the Philippine  
Commission.**

**Volumes IX-XIII.—Chief of Engineers, River and Harbor Improvements.**



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**APPENDIXES**

**TO THE**

**REPORT OF THE CHIEF OF ENGINEERS,**

**UNITED STATES ARMY.**

**(CONTINUED.)**

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1

## APPENDIX K.

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### IMPROVEMENT OF PATAPSCO RIVER AND BALTIMORE HARBOR, MARYLAND.

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*REPORT FOR THE FISCAL YEAR ENDING JUNE 30, 1903, WITH OTHER DOCUMENTS RELATING TO THE WORKS. OFFICERS IN CHARGE, COL. PETER C. HAINS, CORPS OF ENGINEERS (NOW BRIGADIER-GENERAL, UNITED STATES ARMY), LIEUT. COL. CHARLES J. ALLEN, AND COL. W. A. JONES, CORPS OF ENGINEERS.*

#### IMPROVEMENTS.

- |  |   |
|--|---|
| 1. Patapsco River and channel to Baltimore, Maryland.                    | 3. Harbor of Southwest Baltimore (Spring Garden), Maryland. |
| 2. Channel to Curtis Bay, in Patapsco River, Baltimore Harbor, Maryland. |   |

#### SURVEY.

4. Main ship channel, Patapsco River and Baltimore Harbor, Maryland.

#### HARBOR LINES.

5. Patapsco River at Sparrow Point, Baltimore Harbor, Maryland.

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UNITED STATES ENGINEER OFFICE,  
*Baltimore, Md., July 23, 1903.*

GENERAL: I have the honor to forward herewith the annual reports for the year ending June 30, 1903, for the works of improvement of rivers and harbors in my charge.

Very respectfully, your obedient servant,

W. A. JONES,  
*Colonel, Corps of Engineers.*

Brig. Gen. G. L. GILLESPIE,  
*Chief of Engineers, U. S. A.*

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#### K 1.

### IMPROVEMENT OF PATAPSCO RIVER AND CHANNEL TO BALTIMORE, MARYLAND.

During the fiscal year dredging was in progress until May 22, 1903, under a continuing contract for the completion of the project, when it was finished thirty-eight days in advance of the contract time. Three dredges, two of the clam-shell and one of the elevator type, were engaged on the work at different periods, removing 1,585,397 cubic yards of material in the fiscal year. The total quantity removed under the contract was 11,029,596 cubic yards.

# 1028 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

Proposals for maintenance of the 30-foot channel to June 30, 1904, were opened June 22, 1903, and preliminary arrangements are in progress for making a contract. Some vessels trading with the port can not avail themselves of their full draft in the existing channel, and its deepening to 35 feet at mean low water is desirable, but if Congress does not authorize the proposed 35-foot project at its next session \$50,000 will be necessary for maintenance of the 30-foot channel to June 30, 1905.

\* \* \* \* \*

## Money statement.

July 1, 1902, balance unexpended .....	\$271, 893. 24
June 30, 1903, amount expended during fiscal year .....	218, 602. 52
July 1, 1903, balance unexpended .....	53, 290. 72
July 1, 1903, outstanding liabilities .....	42. 60
July 1, 1903, balance available.....	53, 248. 12
Amount that can be profitably expended in fiscal year ending June 30, 1905, for maintenance of improvement, in addition to the balance unexpended July 1, 1903 .....	
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	50, 000. 00

The following are the amounts and dates of appropriations for improving harbor at Baltimore. Md., including Patapsco River:

August 30, 1852.....	\$20, 000	March 3, 1881.....	\$150, 000
August 15, 1856.....	100, 000	August 2, 1882.....	450, 000
June 28, 1864.....	20, 000	July 5, 1884.....	250, 000
June 23, 1866.....	5, 200	August 5, 1886.....	150, 000
March 3, 1867.....	75, 000	August 11, 1888.....	300, 000
July 25, 1868.....	17, 000	September 19, 1890.....	340, 000
April 10, 1869.....	26, 730	March 3, 1891.....	151, 200
July 11, 1870.....	42, 900	August 5, 1892.....	208, 000
March 3, 1871.....	50, 000	August 18, 1894.....	50, 000
June 10, 1872.....	100, 000	June 3, 1896.....	400, 000
March 3, 1873.....	200, 000	June 3, 1896.....	50, 000
June 23, 1874.....	75, 000	March 3, 1899.....	200, 000
March 3, 1875.....	75, 000	June 6, 1900.....	324, 648
August 14, 1876.....	75, 000	March 3, 1901.....	475, 352
June 18, 1878.....	75, 000	June 13, 1902.....	25, 000
March 3, 1879.....	160, 000		
June 14, 1880.....	100, 000	Total .....	4, 741, 030

## CONTRACT IN FORCE.

Continuous contract with Simon Hess, at 8.33 cents per cubic yard, approved July 5, 1899, commenced September 12, 1899, and completed May 22, 1903.

## COMMERCIAL STATISTICS FOR FISCAL YEAR ENDING JUNE 30, 1903.

### Imports.

	Free.	Dutiable.	Total.
1902.....	\$13, 663, 934	\$9, 282, 645	\$22, 946, 579
1903.....	10, 684, 061	17, 123, 797	27, 807, 878
Total .....	a 2, 979, 853	b 7, 841, 152	b 4, 861, 299

a Decrease.

b Increase.

## Imports in American vessels in 1903:

Sailing .....	\$1, 260, 820
Steam .....	603, 381

## Imports in foreign vessels in 1903:

Sailing .....	1, 126, 845
Steam .....	24, 701, 939

Imports in cars overland..... 67, 884

Total ..... 27, 760, 869

*Domestic exports.*

## In American vessels in 1903:

Sailing .....	\$715, 979
Steam .....	1, 575, 179

## In foreign vessels in 1903:

Sailing .....	26, 813
Steam .....	79, 353, 026

Total ..... 81, 670, 997

*Principal articles exported.*

	Tons.		Tons.
Cattle .....	41, 920	Beef products .....	4, 992
Grain .....	678, 978	Pork .....	5, 786
Flour .....	277, 271	Lard .....	31, 103
Coal .....	121, 083	Oleomargarine .....	7, 507
Copper .....	42, 589	Starch .....	281
Cotton, unmanufactured .....	26, 959	Rosin .....	26, 888
Glucose .....	492	Tobacco .....	34, 089
Iron and steel .....	9, 275	Oils .....	120, 138
Oil cake .....	39, 431	Wood, and manufactures of .....	617, 054

Amount of duties collected in 1903..... \$5, 236, 996. 24

Miscellaneous customs receipts in 1903..... 180, 246. 72

Total receipts in 1903..... 5, 417, 242. 96

Duties on merchandise in bond in 1903..... 175, 314. 10

*Summary of duties collected in 1903.*

Imports and miscellaneous customs receipts..... \$5, 417, 242. 96

Merchandise in bond ..... 175, 314. 10 |

Merchandise transported with appraisement..... 36, 113. 51

Total ..... 5, 628, 670. 57

*Statistical recapitulation.*

Dutiable imports have increased..... \$7, 841, 152. 00

Free imports have decreased..... \$2, 979, 853. 00

Domestic exports have increased..... \$1, 167, 922. 00

Tonnage (foreign) has decreased ..... 13, 063 |

Duties collected have increased..... \$1, 842, 137. 77

Duties on merchandise in bond have decreased..... \$33, 396. 03

Duties on merchandise in bond, with and without appraisement, have decreased..... \$224, 575. 67

*Tonnage movement.*

	1901-2.		1902-3.	
	Number.	Quantity.	Number.	Quantity.
Foreign trade:		Tons.		Tons.
Entered.....	815	1, 405, 607	790	1, 406, 529
Cleared .....	789	1, 352, 873	715	a 1, 338, 888
Coastwise trade:				
Entered.....	1, 484	2, 110, 781	1, 504	b 2, 187, 517
Cleared .....	2, 187	2, 660, 609	2, 213	c 2, 803, 518

a Decrease 1 per cent.

b Increase  $2\frac{1}{4}$  per cent.

c Increase 5 per cent.

1030 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

*Alien passengers, 1902-3.*

Males .....	44,328
Females .....	11,474
<b>Total .....</b>	<b>55,802</b>

*Vessels built, 1902-3.*

	Number.	Tons.	Value.
Steam .....	17	9,903	\$1,358,700
Sail .....	49	10,690	197,200
<b>Total .....</b>	<b>66</b>	<b>20,593</b>	<b>1,455,900</b>

*Steamship lines.*

	Number of ships.	Tonnage.	Destination.
Hamburg American .....	12	49,555	Hamburg.
Atlantic Transport .....	5	21,597	London.
Lord Line .....	13	30,876	Belfast, Cardiff, Dublin.
Earn Line .....	7	11,408	West Indies, South America, Central America, Mexico, and Europe.
North German Lloyd .....	10	52,219	Bremen.
Di Giorgio Importing and Steamship Co. ....	7	4,782	Cuba and Jamaica.
United Fruit Co. ....	5	3,818	Jamaica.
Johnston Line .....	6	28,055	Liverpool.
Donaldson .....	5	18,186	Glasgow.
Puritan .....	4	9,060	Antwerp.
Neptune .....	7	15,192	Rotterdam.
Elder .....	3	5,389	Mediterranean ports.
Mexican Lloyd Trading and Transport Co. ....	2	3,798	Vera Cruz and Tampico.
Deutch American Petroleum Gesellschaft ..	8	15,367	German ports.
American Petroleum Co .....	6	10,877	Various.

The following lines have reduced the number of vessels:

Hamburg American .....	7
Atlantic Transport .....	2
Earn Line .....	1
North German Line .....	7
United Fruit Company .....	1
Johnston Line .....	1
Donaldson Line .....	6
Neptune Line .....	1
Elder Line .....	1
<b>Lines discontinued: Blue Cross .....</b>	<b>27</b>
<b>Total loss .....</b>	<b>1</b>
<b>Total loss .....</b>	<b>28</b>

The following lines have added to the number of vessels:

Lord Line .....	1
Di Giorgio Importing and Steamship Company ..	1
New lines:	
Mexican Lloyd Trading and Transport Company ..	2
Deutch American Petroleum Gesellschaft .....	8
American Petroleum Company .....	6
<b>Net total loss .....</b>	<b>18</b>
<b>Net total loss .....</b>	<b>10</b>

## K 2.

IMPROVEMENT OF CHANNEL TO CURTIS BAY, IN PATAPSCO RIVER,  
BALTIMORE HARBOR, MARYLAND.

A continuing contract for the completion of the existing project was made, and dredging under it commenced March 9, 1903, by one dredge, and by another on the 10th of the same month. The two dredges are of the clam-shell type and have removed 716,526 cubic yards of material, which is an indication that the project will be completed by the last of the calendar year.

An index map showing this work is attached to the report on the improvement of Patapsco River.

*Money statement.*

July 1, 1902, balance unexpended .....	\$50,000.00
Amount appropriated by sundry civil act approved March 3, 1903.....	146,000.00
	<u>196,000.00</u>
June 30, 1903, amount expended during fiscal year .....	60,735.77
July 1, 1903, balance unexpended .....	135,264.23
July 1, 1903, outstanding liabilities .....	349.21
	<u>134,915.02</u>
July 1, 1903, balance available .....	<u>118,365.84</u>
July 1, 1903, amount covered by uncompleted contracts .....	118,365.84

The following are the amounts and dates of appropriations for improving channel to Curtis Bay, in Patapsco River, Baltimore Harbor, Maryland:

July 13, 1892 .....	\$28,000
August 13, 1894 .....	12,000
June 13, 1902 .....	50,000
March 3, 1903 .....	146,000
Total .....	<u>236,000</u>

## CONTRACT IN FORCE.

Continuous contract with Sanford & Brooks Company, at 11½ cents per cubic yard, approved January 30, 1903, commenced March 5, 1903, and expires March 5, 1906.

## COMMERCIAL STATISTICS.

The statistics of the port of Baltimore include this harbor.

## K 3.

IMPROVEMENT OF HARBOR OF SOUTHWEST BALTIMORE (SPRING  
GARDEN), MARYLAND.

A continuing contract was made for the completion of the project, and work commenced upon it by one dredge of the clam-shell type.

1032 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

December 10, 1902, and by another dredge of the elevator type on May 23, 1903; 557,406 cubic yards of material were removed.

An index map showing this work is attached to the report on the improvement of Patapsco River.

*Money statement.*

July 1, 1902, balance unexpended.....	\$93,000.00
Amount appropriated by sundry civil act approved March 3, 1903 .....	221,000.00
	<hr/>
	314,000.00
June 30, 1903, amount expended during fiscal year .....	45,312.97
	<hr/>
July 1, 1903, balance unexpended .....	268,687.03
July 1, 1903, outstanding liabilities .....	174.20
	<hr/>
July 1, 1903, balance available .....	268,512.83
	<hr/>
July 1, 1903, amount covered by uncompleted contracts.....	244,957.73

The following are the amounts and dates of appropriations for improving harbor of Southwest Baltimore (Spring Garden), Md.:

June 23, 1896 .....	\$5,000
June 13, 1902 .....	88,000
March 3, 1903.....	221,000
	<hr/>
Total.....	314,000

CONTRACT IN FORCE.

Continuous contract with the Maryland Dredging and Contracting Company, at 12½ cents per cubic yard, approved November 3, 1902, commenced December 6, 1902, and expires December 6, 1905.

COMMERCIAL STATISTICS.

The statistics of the port of Baltimore include this harbor.

K 4.

REVISED ESTIMATE OF COST OF INCREASING THE DEPTH OF THE MAIN SHIP CHANNEL OF PATAPSCO RIVER AND BALTIMORE HARBOR TO 35 FEET, WITH WIDTH OF 600 FEET AT BOTTOM.

[Printed in H. Doc. No. 186, 57th Cong., 2d sess.]

OFFICE OF THE CHIEF OF ENGINEERS,

UNITED STATES ARMY,

Washington, December 16, 1902.

SIR: In response to a concurrent resolution dated January 19, 1901, the Secretary of War submitted to Congress an estimate of the cost of increasing the depth of the main ship channel of the Patapsco River and Baltimore Harbor to 35 feet, with width of 1,000 feet. An estimate for a channel 600 feet in width was also submitted.

The estimates submitted were \$10,700,000 for a channel 1,000 feet

wide and \$5,300,000 for a channel 600 feet wide. These estimates were made at the urgent call of Congress, from the best data at hand, and an excess depth of 2 feet was provided for as a matter of safety. Later surveys made in connection with the work of improvement indicate that by slight changes of alignment, and omitting excess depth as unnecessary, the cost of the 600-foot channel can be reduced from \$5,300,000 to \$3,465,000.

The law provides that after the regular or formal report is made on any examination, survey, or project, no supplemental or additional report or estimate shall be made unless ordered by a concurrent resolution of Congress.

In this case, however, an error having been made in the original estimate as a result of insufficient data and lack of time to secure the same, it appears permissible to submit a correction, and it is recommended that the correction herein contained be submitted to the Speaker of the House of Representatives and the President of the Senate

Very respectfully, your obedient servant,

G. L. GILLESPIE,  
*Brig. Gen., Chief of Engineers,*  
*U. S. Army.*

Hon. ELIHU ROOT,  
*Secretary of War.*

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K 5.

MODIFICATION OF HARBOR LINES IN PATAPSCO RIVER AT SPARROW POINT, BALTIMORE HARBOR, MARYLAND.

OFFICE OF THE MARYLAND STEEL COMPANY,  
*Sparrow Point, Md., May 25, 1903.*

DEAR SIR: For the purpose of increasing its facilities for handling material in connection with its manufacturing plant at Sparrow Point, the Maryland Steel Company hereby respectfully makes application for permission to have its bulkhead and pierhead lines I, M (which were established by the War Department June 6, 1899, as per plan inclosed herewith) extended 800 feet in a westerly direction, thence about 2,400 feet in a northwesterly direction to point J.

Will you kindly advise me at your early convenience if such permission will be granted?

Yours, respectfully,

R. K. WOOD,  
*General Agent.*

Col. C. J. ALLEN,  
*Engineer Corps.*

[First indorsement.]

U. S. ENGINEER OFFICE,  
*Baltimore, Md., May 28, 1903.*

Respectfully submitted to the Chief of Engineers, U. S. Army. Sparrow Point, Md., is about 7 miles below Baltimore, on the northeast side of Patapsco River. All the property at the point is owned by the Maryland Steel Company, and it is the only property holder interested in the establishment of harbor lines.



June 6, 1899, the Acting Secretary of War approved harbor lines at Sparrow Point, at the request of the Maryland Steel Company, and upon the recommendation of Col. Peter C. Hains, Corps of Engineers, and the Acting Chief of Engineers. The report upon the subject is printed on pages 1410 and 1411 of the Annual Report of the Chief of Engineers for 1899. The lines then established are shown on the accompanying blueprint in white, extending from F to K, J, M, and I.

The Maryland Steel Company now asks for a modification of those lines by extending the lines I, M 800 feet in a westerly direction and thence about 2,400 feet in a northwesterly direction to J, as shown in red on the blueprint. The extension of the lines as proposed will not interfere with the interests of commerce and navigation, and approval is recommended.

CHAS. J. ALLEN,  
*Lieut. Col., Corps of Engineers*

[Second indorsement.]

OFFICE CHIEF OF ENGINEERS, U. S. ARMY,  
June 2, 1903.

Respectfully submitted to the Secretary of War.

The Maryland Steel Company requests a modification of the combined pierhead and bulkhead line in front of its property at Sparrow Point, Md.

Inviting attention to the report of the local officer in the preceding indorsement, from which it appears that the proposed change will not interfere with the interests of commerce and navigation, I recommend that the company's request be granted.

For the sake of convenience the proposed modification has been indicated on the chart<sup>a</sup> showing the lines as originally established, and I further recommend that if this request be sanctioned the Secretary of War place his approval upon this tracing,<sup>a</sup> which has been prepared for his signature.

G. L. GILLESPIE,  
*Brig. Gen., Chief of Engineers,*  
*U. S. Army.*

NOTE.—The lines referred to above, and shown on the map mentioned, were approved by the Assistant Secretary of War June 9, 1903, the approval being indicated on the map.<sup>a</sup>

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<sup>a</sup> Not printed.

worthless, the removal of the old structure, the rebuilding of about 1,200 linear feet of the boundary fence, which had become unserviceable, the cutting off and removing of a dense growth of overhanging branches along the Seventeenth street sewer canal, the cutting of brush and weeds on the park, and other work incidental to the maintenance of the improvement.

Owing to the comparatively small amount of funds available for this work, and to the local conditions, it was impracticable to undertake any extensive operations prior to the close of the year. The channels, which had been dredged in 1901 to as great an extent as the funds then available would permit, remained in serviceable condition during the year 1902. The annual spring freshets generally shoal the channels to a greater or less extent, and it was considered unwise to expend the available funds until the effect of the spring freshets of 1903 was determined. These freshets continued until unusually late in the season, and the water was frequently highly charged with silt, although the maximum height reached at Easbys Point was but 6.1 feet above low tide. The desired examination of the channel could not be made until the last of May and first of June, and it revealed the fact that considerable shoaling had occurred in both channels. Specifications were accordingly prepared for work which, while it will afford temporary relief, will necessitate the expenditure of practically all of the available funds. Proposals will be invited for this work early in July, 1903.

The advantages which will result to navigation from the increase in channel depth and to the park improvement from the additional filling have been stated in previous reports. In this connection reference is made to the Annual Report for 1902, page 203, and for 1901, page 1401, in the latter of which an estimate of the cost of this work is given. At least one large vessel coming to Washington has recently been obliged to first partially discharge its cargo at another port, which could have been avoided had the same depth been available at Washington as exists below it. With an increase of depth more deep-draft vessels would undoubtedly seek this port.

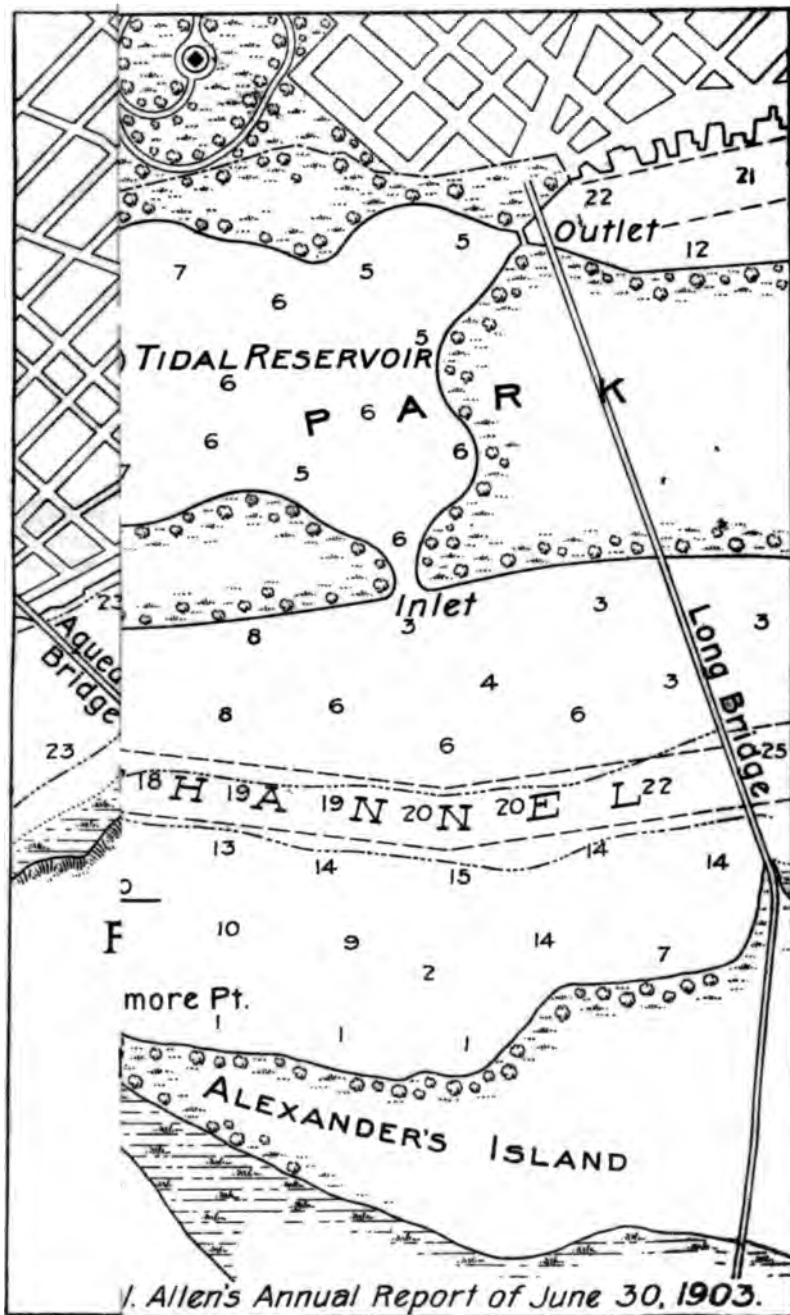
#### POTOMAC PARK.

Congress, by act of March 3, 1897, declared the reclaimed flats a public park. This extensive tract, amounting to 621 acres of land and 118 acres of inclosed water area, is capable of being transformed into one of the finest parks in the country. For further information reference is invited to the Annual Report for 1899, page 1416, for 1900, page 1702, and for 1901, page 1401.

While it is necessary that the greater part of this area be, for the present, reserved for the deposit of material dredged from the river channels, if sufficient funds be appropriated, certain portions thereof can at the same time be filled to their final height and covered with a rich alluvial soil by dredging, and then devoted exclusively to park purposes.

During the past fiscal year about 11,000 cubic yards of good earth, free from objectionable matter, were dumped upon Potomac Park at localities remote from the river where deposit by dredging is most expensive, and graded by private parties under permit free of cost to the United States.

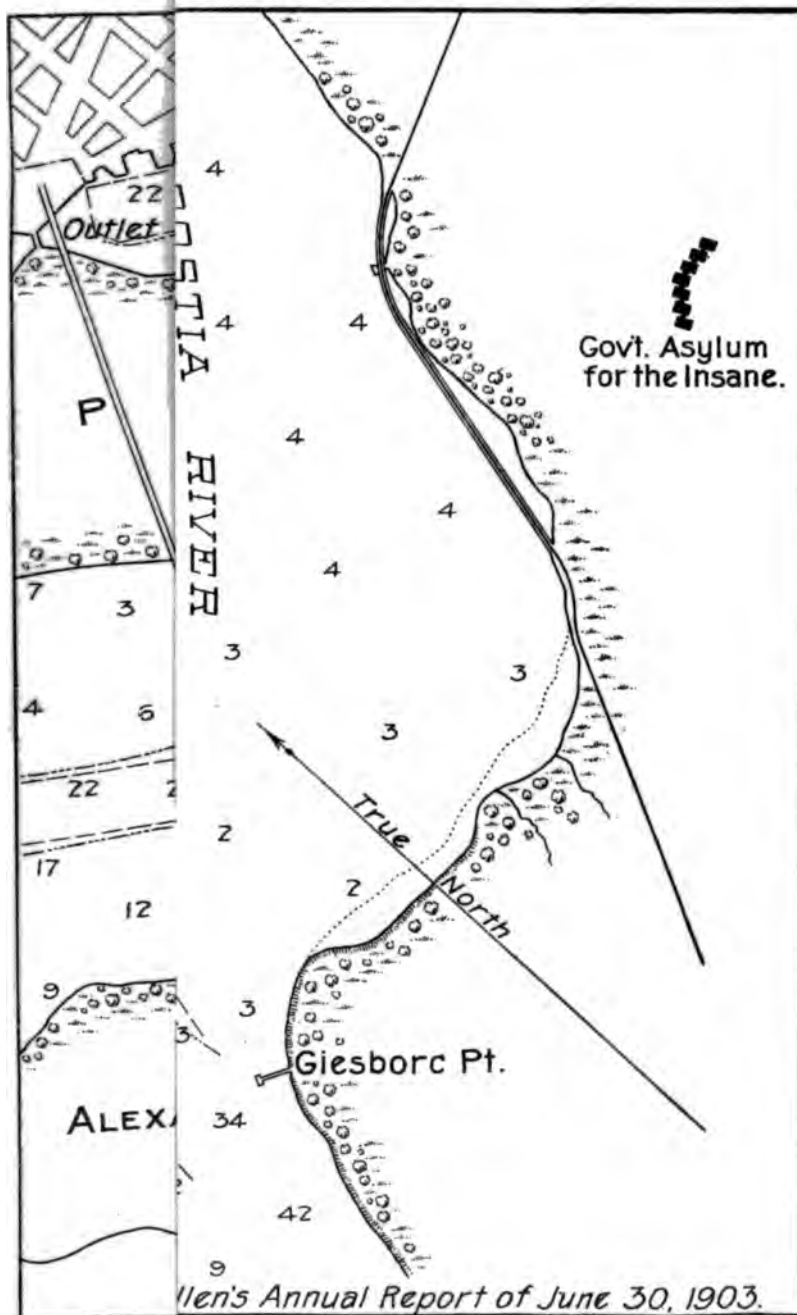
The reports for several years past have called attention to the fact



ANDREW S. SHAW

Eng 58 1





ANDREW & BRANHAM PHOTOGRAPH



that about \$5,000 is required per annum for maintenance and preservation of the reservation, inlet gates, sea wall, training dike, for clearing weeds and underbrush, etc., and the need of proper police supervision has been noted.

#### APPROPRIATIONS.

Owing to the continual shoaling of the dredged channels by deposits from freshets and the considerable expenditure required for the maintenance of this improvement it has been impossible, with the small appropriations recently made for this work, to undertake any extensive operations toward the completion of the general project. Attention is invited to the fact that of the \$2,434,000 which has been appropriated for this work \$2,035,000 was appropriated in the first ten years of the project, from August, 1882, to July, 1892, and but \$399,000 has been appropriated in the eleven years since the latter date.

In view of the urgent popular demand for better navigation facilities and for additional park space it is believed that appropriations sufficiently large to insure the completion, at an early day, of the entire project, including channel depth and also height of fill, would be welcomed by the public.

A considerable appropriation is necessary for the removal of freshet deposits and also for maintenance; it is also essential, for economy, that an appropriation sufficient for the final dredging of the tidal reservoir and for the construction of the reservoir inlet gates be made at one time, as the tidal reservoir will be inaccessible to a dredge after the gates are built, while the construction of the gates will prevent shoaling in the reservoir after it has been dredged.

The sum of \$400,000 can be profitably expended during the fiscal year ending June 30, 1905, in the accomplishment of the work above outlined.

#### *Money statement.*

July 1, 1902, balance unexpended .....	\$87, 588. 24
June 30, 1903, amount expended during fiscal year .....	7, 300. 30
July 1, 1903, balance unexpended .....	80, 287. 94
July 1, 1903, outstanding liabilities .....	139. 00
July 1, 1903, balance available .....	80, 148. 94
Amount (estimated) required for completion of existing project .....	519, 020. 00
Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903:	
For works of improvement .....	\$395, 000. 00
For maintenance of improvement .....	5, 000. 00
	400, 000. 00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

#### APPROPRIATIONS FOR THE IMPROVEMENT.

August 2, 1882 .....	\$400, 000	March 3, 1899 (appropriated,	
July 5, 1884 .....	500, 000	\$100,000; allotted Potomac	
August 5, 1886 .....	375, 000	River below Washington,	
August 11, 1888 .....	300, 000	\$26,000) .....	\$74, 000
September 19, 1890 .....	260, 000	June 13, 1902 .....	75, 000
July 13, 1892 .....	200, 000		
August 18, 1894 .....	150, 000	Total .....	2, 434, 000
June 3, 1896 .....	100, 000		

# 1038 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

## COMMERCIAL STATISTICS.

[Furnished by Mr. J. W. Averill, Washington, D. C.]

### *Receipts and shipments.*

Calendar year.	Coal.	Ice.	Lumber.	Sand.	Wood.	Miscellaneous.	Total.
	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>
1902.....	159,564	72,800	66,098	187,541	28,125	79,397	599,525

In addition to the foregoing, the estimated amount of miscellaneous freight received and shipped by the Norfolk, Baltimore, and river steamers during the year, as obtained from the agents of the different lines, is 73,387 tons.

The amount of sand and stone reported includes that brought from and shipped to points below Alexandria only, and not what was handled around the city. The annual reports heretofore have included the Anacostia trade, which is now reported under the Anacostia River improvement. The amount of anthracite coal received was much less than usual on account of the strike in the mines.

### *Number of vessels of various classes arriving and departing.*

Calendar year.	Steamers drawing from 5 to 15 feet, 100 to 600 tons.	Vessels drawing from 10 to 21 feet, 400 to 2,600 tons.	Vessels drawing from 4 to 10 feet, 30 to 400 tons.	Barges drawing from 3 to 12 feet, 100 to 700 tons.
1902.....	1,367	290	1,875	1,900

Ferry and local passenger steamers are not included in the above.

## L 2.

### IMPROVEMENT OF POTOMAC RIVER BELOW WASHINGTON, DISTRICT OF COLUMBIA.

#### WORK OF THE FISCAL YEAR ENDED JUNE 30, 1903.

Dredging at Mattawoman shoal under the supplemental contract of April 30, 1902, with Rittenhouse Moore, of Mobile, Ala., which was temporarily suspended at the close of the last fiscal year to permit the repair of the contractor's plant, was resumed July 7, 1902.

Considering the character of material, which was compact gravel interspersed with some loose stones, the largest of which was estimated to contain between 5 and 6 cubic yards, satisfactory progress was made, and the work under this contract at Mattawoman shoal was completed September 20.

The dredge was at once transferred to Kettle Bottom shoals, where work was begun on September 22 and completed October 3.

Upon the completion of the work at Kettle Bottom shoals the dredge was taken to Alexandria, Va., for repairs.

On October 21 work was begun at Mattawoman shoal under the supplemental contract of September 30, 1902, providing for widening the channel through that shoal. Very satisfactory progress was made up to December 13, 1902, when all the work provided for under this contract was completed.



the 1990s, the number of people in the world who are undernourished has declined from 1.1 billion to 800 million. The number of people who are malnourished has declined from 1.5 billion to 1 billion. The number of people who are obese has increased from 100 million to 300 million. The number of people who are overweight has increased from 100 million to 300 million. The number of people who are obese and overweight has increased from 100 million to 300 million. The number of people who are obese and overweight has increased from 100 million to 300 million.

Figure 1. The effect of the number of trials on the mean number of correct responses. The number of correct responses was significantly higher for the 10-trial condition than for the 5-trial condition. Error bars represent the standard error of the mean.

## L 3.

## IMPROVEMENT OF ANACOSTIA RIVER, DISTRICT OF COLUMBIA.

WORK OF THE FISCAL YEAR ENDED JUNE 30, 1903.

Proposals for dredging were invited October 27 and opened November 26, 1902. The contract was awarded to the lowest bidder for the entire work, the Sanford & Brooks Company, of Baltimore, Md., at 10.95 cents for channel dredging and 14.75 cents per cubic yard for trench dredging.

Under this contract a channel 300 feet or more wide and 20 feet deep is to be dredged through the shoals in the Anacostia River from its mouth to the eastern boundary of the navy-yard. The dredged material is to be deposited upon the flats in front of the insane asylum, raising a tract of about 100 acres to about 2 feet above ordinary high water. To retain the deposited material it is necessary that it be suitably inclosed. This is provided for by dredging a trench along the river front of the area to be reclaimed, filling the trench with riprap stone (under a separate contract), and then forming an embankment behind the riprap with material obtained by widening the trench. To prevent the material from spreading out laterally over the flats the contractor is to construct suitable cross embankments or dikes at his expense and of a type to be selected by himself.

On February 6, 1903, the throwing up of the upper cross embankment was begun with the dredge *Sinton*, and on the 27th of the same month the dredging of the trench along the river front was commenced with the dredge *Canton*. This work was somewhat delayed by bad weather, high tides, and lack of coal. By May the embankments had been worked over several times, and it had been found that owing to the soft character of the material it was impracticable to raise them to a sufficient height by dredging alone. The dredge *Sinton* was withdrawn from the work on May 22, while the *Canton* was employed on the front embankment up to June 3, and on June 9 it was also withdrawn. The total amount of material dredged from the trench along the river front during the fiscal year was 22,692.8 cubic yards. No computation of the material deposited in the cross embankments was made, as this is not paid for.

In April the construction of a light timber fence or dike along the crest of the embankments thrown up by the dredges was begun by the contractor and this work was in progress at the close of the fiscal year.

Suitable waste weirs have been constructed, piles driven for the discharge pipe, and the channel lines ranged out; but at the close of the fiscal year the hydraulic dredge, which was daily expected, had not arrived.

The wreck of a small schooner which was encountered within the limits of the channel to be dredged and near Buzzard Point was blasted and removed by the dredge *Canton* just before it was withdrawn.

Proposals for furnishing riprap stone and depositing the same in the trench where it would protect the embankment and later serve as the foundation for the sea wall were invited October 27 and opened November 26, 1902. The contract was awarded to the lowest bidder, Charles G. Smith & Son, of Washington, D. C., at \$1.075 per cubic yard.

## ACQUISITION OF LAND.

Some small amount of land located below the Navy-Yard Bridge is required for the improvement, for deposit of dredged material. Although several Government reservations front on the river, including the navy-yard, the Hospital for the Insane, and the Washington Barracks, still the greater part of the shore is believed to be owned by private parties.

It would seem especially desirable that such land as is needed for the improvement be acquired, and that all matters as to riparian rights and ownership of the reclaimed land be settled by the condemnation and purchase of a strip of land adjacent to the shore or otherwise before the flats at these localities are reclaimed. The land to be acquired is believed to be of but insignificant value at the present time. If found expensive, however, it may be more economical to convey the dredged material to other points for deposit.

As delays in proceedings of this character might result in serious interference with the progress of the improvement, attention is thus early invited to this subject.

It is proposed for the present to deposit material only in front of Government reservations, where legal complications can not arise, but these areas will soon become filled.

## APPROPRIATIONS.

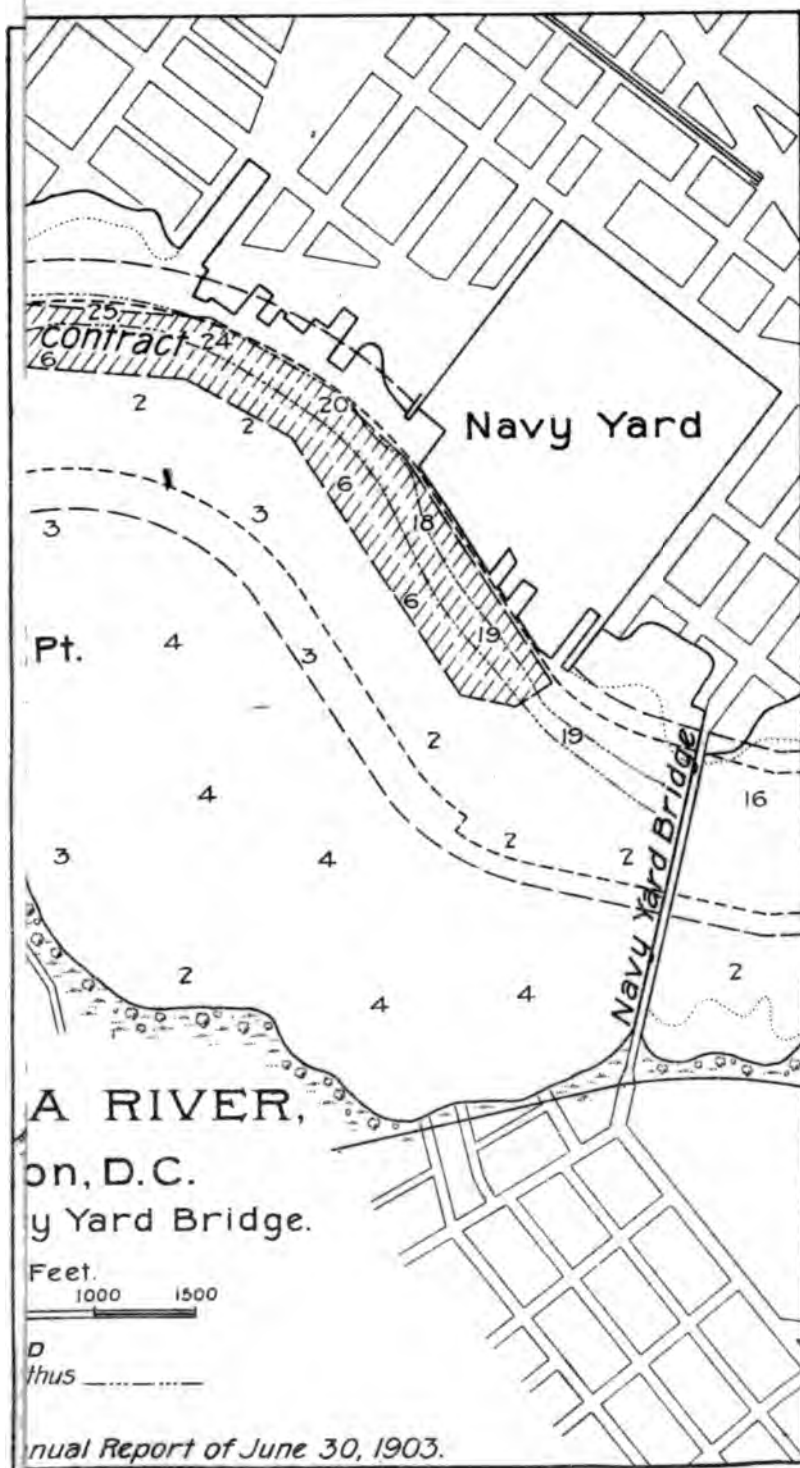
For the successful and economical prosecution of this work large and continuous appropriations are desirable, as was clearly stated in presenting the original estimates of the cost of the improvement. The estimated unit price for dredging, which is considerably lower than the prices which have usually been paid for such work on the Potomac, is based upon this assumption, and if the appropriations should be small and made at irregular intervals the actual cost of the work would be more than the estimated cost.

The channels should be rendered available for navigation and the flats should be entirely reclaimed to a height which will place them above the reach of ordinary tides at the earliest day practicable, after which the remainder of the work may be prosecuted at a less rapid rate.

The sum of \$300,000 can be profitably expended during the fiscal year ending June 30, 1905, in dredging and properly depositing the dredged material.

*Money statement.*

July 1, 1902, balance unexpended .....	\$151, 463. 06
June 30, 1903, amount expended during fiscal year .....	18, 119. 93
July 1, 1903, balance unexpended .....	133, 343. 13
July 1, 1903, outstanding liabilities.....	279. 00
July 1, 1903, balance available .....	133, 064. 13
July 1, 1903, amount covered by uncompleted contracts.....	122, 703. 00
(Amount (estimated) required for completion of existing project .....	1, 067, 061. 94
{ Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903.....	300, 000. 00
{ Submitted in compliance with requirements of sundry civil act of June 4, 1897.	





## APPROPRIATIONS.

The following appropriations have been made:

September 19, 1890 (allotment from appropriation for improving Potomac River).....	\$20,000
June 13, 1902 .....	150,000
Total .....	170,000

## CONTRACTS IN FORCE.

Contractor: Sanford & Brooks Company, of Baltimore, for dredging; amount, 36,000 cubic yards, more or less, in the trench, and 1,100,000 cubic yards, more or less, in the channel.

Date of contract: January 3, 1903.

Approved: January 21, 1903.

Date for commencement: February 20, 1903.

Date for completion: June 30, 1904; not less than 100,000 cubic yards to be dredged in each month, except that work may be suspended during the months of December, January, February, and March.

Rate: 14.75 cents per cubic yard for dredging in the trench, and 10.95 cents per cubic yard for dredging in the channel.

Contractor: Charles G. Smith & Son, of Washington, D. C., for furnishing and placing riprap stone in trench; amount, 8,000 cubic yards, more or less; date of contract, January 13, 1903.

Approved: January 19, 1903.

Date for commencement: February 26, 1903; from 200 to 700 cubic yards of stone to be delivered regularly per week according to instructions from the engineer officer in charge.

Rate: \$1.075 per cubic yard.

## COMMERCIAL STATISTICS.

[Furnished by Mr. J. W. Averill, Washington, D. C.]

*Receipts and shipments, 1902.*

	Tons.		Tons.
Asphalt.....	2,700	Shingles .....	127
Brick clay .....	22,160	Stone.....	19,934
Coal.....	5,460	Wood .....	9,375
Laths.....	222	Miscellaneous freight shipped	
Lumber .....	4,008	by the United States Navy-	
Naphtha, oil, and gasoline .....	12,329	Yard to and from Indian	
Piles .....	2,812	Head, Md .....	15,826
Paving blocks.....	7,500		
Railroad ties.....	5,000	Total.....	230,465
Sand and gravel.....	123,012		

*Number of vessels of various classes arriving and departing, 1902.*

Navy vessels drawing from 10 to 20 feet, 100 to 2,800 tons .....	45
Tugs drawing from 6 to 10 feet, 15 to 100 tons .....	1,500
Vessels drawing from 4 to 10 feet, 30 to 300 tons .....	150
Barges and scows drawing from 3 to 12 feet, 100 to 700 tons .....	1,200
Total .....	2,895

## L 4.

## IMPROVEMENT OF BRETON BAY AND PATUXENT RIVER, MARYLAND.

## (A) BRETON BAY.

## WORK OF THE FISCAL YEAR ENDED JUNE 30, 1903.

An allotment of \$6,000 from the amount appropriated by act of Congress of June 13, 1902, for improving Breton Bay and Patuxent River, Maryland, was made on September 4, 1902, to be applied to the work at Breton Bay.

Proposals for dredging were invited November 6, and opened December 6, 1902, the work to be done under the same contract as similar dredging in Lower Machodoc Creek, Virginia. The contract was awarded to the lowest bidder, John Miller, of Washington, D. C., at 17.4 cents per cubic yard, measured in scows.

Dredging under the above contract was begun May 1 and completed May 26, 1903. As a result of these operations a channel at least 100 feet wide, 10 feet deep, and 3,800 feet long was dredged through the shoalest part of the bar, with a turning basin of the same depth, 200 feet wide, and about 400 feet long at the Leonardtown wharf, 31,805.3 cubic yards of material being excavated and deposited in Echo Bend and near Paw Paw Hollow.

\* \* \* \* \*

*Money statement.*

Allotment from appropriation of June 13, 1902 .....	\$6,000.00
June 30, 1903, amount expended during fiscal year .....	5,996.03
July 1, 1903, balance unexpended .....	3.97
(Amount (estimated) required for completion of existing project .....	30,480.00
Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903 .....	8,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897.	

## APPROPRIATION.

June 13, 1902 (allotted) ..... \$6,000.00

## CONTRACT IN FORCE.

Contractor: John Miller, of Washington, D. C., for dredging.

Amount: 30,000 cubic yards, more or less.

Date of contract: December 22, 1902.

Approved: January 9, 1903.

Date for commencement: February 9, 1903.

Date for completion (including dredging in Lower Machodoc Creek, Virginia,

under the same contract): Within four months from date of commencement; not less than 10,000 cubic yards to be dredged per month, excepting that work may be suspended during the months of December, January, February, and March.

Rate: 17.4 cents per cubic yard.

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COMMERCIAL STATISTICS.

It is roughly estimated that the tonnage for Breton Bay during the calendar year ended December 31, 1902, was 20,000 tons, consisting principally of oysters, grain, farm produce, ice, tobacco, and general merchandise.

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REPORT OF THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS.

WASHINGTON BARRACKS,

*Washington, D. C., September 22, 1903.*

GENERAL: By first indorsement, Office Chief of Engineers, United States Army, May 1, 1903, there was referred to the Board of Engineers for Rivers and Harbors a resolution adopted by the Committee on Rivers and Harbors of the House of Representatives, wherein there was required among other things the opinion of the Board upon the advisability of continuing the improvement of Breton Bay, Maryland, or modifying the project therefor.

The Board has considered all the data obtainable in this case and has, through a committee, visited the locality and held at Leonardtown, Md., a duly advertised public hearing, at which interested parties were given opportunity to express their views.

Breton Bay is a tidal estuary of the Potomac River, which it enters 82 miles below Washington. The bay is about  $6\frac{1}{4}$  miles in length, with a width varying from 1,600 to 6,300 feet. A ruling depth of about 15 feet at low water is found in the bay through a distance of about 4 miles from its mouth. The harbor affords a safe anchorage for vessels. Leonardtown, situated at the head of navigation, 6 miles above the mouth of the bay, has a population of about 600, and is the county seat of St. Marys County. The surrounding country is productive and tributary to Leonardtown.

A survey of Breton Bay was made in 1874 (Annual Report of Chief of Engineers for 1875, pp. 108-110), which showed that at that time navigation was obstructed by a shoal at the head of the bay, extending from the 9-foot contour to the Leonardtown wharf, a distance of about 1 mile, the least depth on the shoal being 5 feet at low tide.

The original project for improvement, adopted in 1878, provided for dredging a channel 150 feet wide and 9 feet deep from the 9-foot contour in Breton Bay to the Leonardtown wharf, with a turning basin at the wharf 400 feet wide and 600 feet long. Estimated cost, \$30,000. In 1886 the project was amended so as to provide for a channel 200 feet wide and 10 feet deep, the turning basin to be 800 feet long and 400 feet wide. The estimated cost of the amended project was \$49,000. In 1890 the original project was resumed, a width of 150 feet and depth of 9 feet being deemed sufficient to furnish all the facilities needed for navigation at that time.



From June 18, 1878, to September 19, 1890, nine appropriations, aggregating \$37,500, were made. This sum was applied to dredging 214,229 cubic yards of material. The work called for by the project was completed August 25, 1891. The channel was then 9 feet deep at low tide from the original 9-foot contour in Breton Bay to the Leonardtown wharf. The width of the straight channel was 150 feet, and at the turn off Buzzards Point it was 320 feet. The basin at Leonardtown was 9 feet deep, 370 feet wide, and 600 feet long.

The river and harbor act of March 3, 1899, authorized a preliminary examination and survey of Breton Bay. The report on the survey contained two projects and estimates. The more extensive project was adopted by the river and harbor act of June 13, 1902, which contained the following provision:

Improving Breton Bay and Patuxent River, Maryland, in accordance with the reports submitted in House Documents Numbered, respectively, Two hundred and nine and One hundred and seventy, Fifty-sixth Congress, first session, the larger projects therein described being intended, nine thousand dollars.

The existing project for Breton Bay therefore provides for dredging a channel 200 feet wide and 10 feet deep at low tide, and a turning basin at Leonardtown wharf 10 feet deep, 600 feet long, and 400 feet wide, at an estimated cost of \$36,480.

On September 4, 1902, \$6,000 from the above appropriation was allotted for the improvement of Breton Bay. Its expenditure has resulted in the removal of some 30,000 cubic yards of material and the formation of a channel 10 feet deep and at least 100 feet wide through the upper part of the shoal.

The community about Leonardtown is entirely dependent upon water transportation. The nearest railroad station is Mechanicsville, 16 miles distant over rough country roads.

The commerce involved is of a miscellaneous and general character, and is reported to amount annually to about 13,500 tons, valued at \$244,500. The shipments consist of tobacco, oysters, timber, farm produce, and live stock, and the receipts of coal, lumber, and general merchandise.

There is no reason to believe that the provision of a depth greater than that contemplated by the present project would result in a material increase of commerce; but should a channel of the present projected depth not be maintained, this community would be put to an increased expense for transportation which would much exceed the cost of the work hereinafter proposed. The Board therefore believes that it would be unwise not to provide and maintain a channel 10 feet deep and wide enough to accommodate the class of boats now engaged in this trade. Judging from previous work at this place and the rate at which former dredged cuts have deteriorated, the Board is of opinion that a channel of these dimensions can be secured by the expenditure, at the earliest practicable date, of \$6,000—\$4,000 upon that part of the channel on which no work has been done under the present project and \$2,000 in maintenance upon the remainder of the channel. Thereafter an expenditure of \$4,000 every four years will probably be sufficient to maintain the required channel. A channel of the full width contemplated by the present project—200 feet—may not result from these expenditures, but such width is not strictly necessary. It would be safe to say, however, that a sufficient turning basin and a

channel at least 100 feet wide, and wider at the turn, would be available at all times.

The Board is of opinion that it is desirable for the United States to continue the existing project as to depth, and to maintain such width as may result under the scheme of expenditure suggested above.

Respectfully submitted.

CHAS. J. ALLEN,  
*Lieut. Col., Corps of Engineers.*

H. F. HODGES,  
*Major, Corps of Engineers.*

EDW. BURR,  
*Major, Corps of Engineers.*

C. H. MCKINSTRY,  
*Captain, Corps of Engineers.*

W. V. JUDSON,  
*Captain, Corps of Engineers.*

Brig. Gen. G. L. GILLESPIE,  
*Chief of Engineers, U. S. A.*

[First indorsement.]

OFFICE CHIEF OF ENGINEERS,  
U. S. ARMY,  
*September 26, 1903.*

The views of the Board of Engineers for Rivers and Harbors, as expressed in the within report, are concurred in.

G. L. GILLESPIE,  
*Brig. Gen., Chief of Engineers,*  
*U. S. Army.*

#### (B) PATUXENT RIVER.

##### WORK OF THE FISCAL YEAR ENDED JUNE 30, 1903.

An allotment of \$3,000 from the amount appropriated by act of Congress of June 13, 1902, for improving Breton Bay and Patuxent River, Maryland, was made on September 4, 1902, to be applied to the work in Patuxent River. The allotment was made, however, subject to the result of further examinations as to expediency of its expenditure.

\* \* \* \* \*

##### *Money statement.*

July 1, 1902, balance unexpended .....	\$382. 70
Allotment from appropriation of June 13, 1902 .....	3, 000. 00
July 1, 1903, balance unexpended .....	3, 382. 70
{ Amount (estimated) required for completion of existing project .....	7, 500. 00
{ Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903 .....	3, 000. 00
{ Submitted in compliance with requirements of sundry civil act of June 4, 1897.	

## 1048 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

## APPROPRIATIONS.

The following appropriations have been made:

August 11, 1888 .....	\$5,000
September 19, 1890 .....	6,000
June 13, 1902 (allotted) .....	3,000
<b>Total</b> .....	<b>14,000</b>

## COMMERCIAL STATISTICS.

[Furnished by Weems Steamboat Company, Baltimore, Md.]

*Receipts and shipments by water, 1902.*

	Tons.		Tons.
Coal .....	300	General merchandise .....	1,400
Farm produce .....	1,250	Tobacco .....	750
Grain .....	100		
Lumber .....	100	<b>Total</b> .....	<b>3,800</b>

*Arrival and departure of vessels, 1902.*

Class.	Number.	Tonnage.
Steam, drawing less than 10 feet .....	150	2,000
Sail, drawing less than 10 feet .....	40	800

## REPORT OF THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS.

## WASHINGTON BARRACKS.

*Washington, D. C., September 11, 1903.*

**GENERAL:** By first indorsement, Office Chief of Engineers, United States Army, May 1, 1903, there was referred to the Board of Engineers for Rivers and Harbors a resolution adopted by the Committee on Rivers and Harbors of the House of Representatives, wherein there was required, among other things, the opinion of the Board upon the advisability of continuing the improvement of Patuxent River, Maryland, or modifying the project therefor.

The Board has considered all data obtainable in this case, and, through a committee, has held a public hearing at Bristol Landing, due notice of which had been given to all those known to be interested in this subject. The local agent of the Weems Steamboat Company, of Baltimore, was the only person who appeared before the committee at the public hearing.

The first preliminary examination of this river was made in 1886, and the first survey in 1888. The report on the survey contained an estimate of \$80,000 for improving Bristol and Swan Point bars, 46 and 43 miles, respectively, above the mouth of the river. The estimate covered the dredging of a channel 13 feet deep at mean low water and 200 feet wide through these bars and the provision at Bristol Landing of a basin 300 feet wide.

The river and harbor act of August 11, 1888, appropriated \$5,000 for "Improving Patuxent River, Maryland." This money was expended at Bristol bar and resulted in a channel 12 feet deep and 120 feet wide, extending from the 12-foot contour at the lower end

of the bar to a point about 250 feet above the steamboat wharf (Bristol Landing).

The river and harbor act of September 19, 1890, contained an appropriation of \$6,000 for "Patuxent River: Continuing improvement." The district officer having reported that a channel 100 feet wide and 9 feet deep would afford adequate facilities for present and prospective commerce, this sum was expended in dredging at Swan Point bar, where a channel 9 feet deep and 132 feet wide was completed in June, 1891.

This was regarded as completing the project and further appropriations were not recommended. (Annual Reports of the Chief of Engineers for 1892, p. 143; 1893, p. 154; and 1894, p. 142.)

The river and harbor act of March 3, 1899, called for a preliminary examination of "Patuxent River at Bristol bar." The preliminary examination was followed by a survey, in the report on which two projects were submitted. Congress, in the river and harbor act of June 13, 1902, adopted the more extensive of these projects, the item of appropriation reading:

Improving Breton Bay and Patuxent River, Maryland, in accordance with the reports submitted in House Documents Numbered, respectively, Two hundred and nine and One hundred and seventy, Fifty-sixth Congress, first session, the larger projects therein described being intended, nine thousand dollars.

The Patuxent project provides for dredging a basin 400 feet long, 300 feet wide, and 10 feet deep at Bristol Landing, and a channel 100 feet wide and 10 feet deep at low tide from this basin to the 10-foot contour at the lower end of Bristol bar.

On September 4, 1902, \$3,000 from the above appropriation was allotted to Patuxent River; it was not to be expended, however, until it was "definitely determined whether the allotment recommended is the best for public interests." No work under this allotment has yet been undertaken.

There are many other landings on the Patuxent below Bristol Landing, and the commerce of the river, taken as a whole, is considerable, but that at Bristol Landing is very small. Accurate commercial statistics of the business done at this point are nowhere in print; but it transpired at the public hearing that practically all of the business is done by the Weems Steamboat Company, of Baltimore, and amounts to about 2,000 tons annually. About 500 tons of general merchandise are received, and about 1,500 tons of tobacco, grain, and live stock are shipped. The merchandise received is hauled by carts to two or three country stores, from which the rural population within a radius of 4 or 5 miles is supplied. It is believed that this population is gradually diminishing, as the soil becomes less productive and farm labor more difficult to obtain.

Soundings taken in the vicinity of the landing, in the presence of the committee of the Board, showed that the channel had not materially deteriorated since the date of the survey made in 1899. There is still sufficient depth to enable the regular boat using this landing to reach the dock, but the width of the basin at low water is such that there is difficulty in turning a heavily laden boat. The range of the tide is 2.3 feet. At other than low stages there is ample depth and width to accommodate existing commerce.

In view of these facts the Board believes that it is not desirable for

1050 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

the United States to continue the improvement of Patuxent River, Maryland.

Respectfully submitted.

CHAS. J. ALLEN,  
*Lieut. Col., Corps of Engineers.*

H. F. HODGES,  
*Major, Corps of Engineers.*

EDW. BURR,  
*Major, Corps of Engineers.*

C. H. MCKINSTRY,  
*Captain, Corps of Engineers.*

W. V. JUDSON,  
*Captain, Corps of Engineers.*

Brig. Gen. G. L. GILLESPIE,  
*Chief of Engineers, U. S. A.*

[First indorsement]

OFFICE CHIEF OF ENGINEERS,  
U. S. ARMY,  
September 18, 1903.

The views of the Board of Engineers for Rivers and Harbors, as expressed in the within report, are concurred in.

G. L. GILLESPIE,  
*Brig. Gen., Chief of Engineers,*  
*U. S. Army.*

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L 5.

IMPROVEMENT OF YORK RIVER, OCCOQUAN, LOWER MACHODOC,  
NANDUA, AQUIA, AND CARTERS CREEKS, VIRGINIA.

(A) YORK RIVER.

WORK OF THE FISCAL YEAR ENDED JUNE 30, 1903.

Allotments of \$100, \$2,000, and \$76.98 from the amount appropriated by act of Congress of June 13, 1902, for improving York River, Occoquan, Lower Machodoc, Nandua, Aquia, and Carters creeks, Virginia, were made July 18, September 5, and December 24, 1902, respectively, to be applied to the work at York River.

This amount is not sufficient to permit of dredging operations and will be applied to the maintenance and repair of the dike as soon as the United States plant can be spared from other work upon which it is now engaged.

The sum of \$10,000 can be profitably expended during the fiscal year ending June 30, 1905, in the dredging of the channel and maintenance of the dike.

*Money statement.*

July 1, 1902, balance unexpended .....	\$453. 95
Allotments from appropriation of June 13, 1902 .....	2, 176. 98
	<hr/> 2, 630. 93
June 30, 1903, amount expended during fiscal year .....	491. 95
	<hr/> 2, 138. 98
July 1, 1903, balance unexpended .....	<hr/> 67, 000. 00
Amount (estimated) required for completion of existing project .....	
Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903:	
For works of improvement.....	\$8, 000. 00
For maintenance of improvement .....	2, 000. 00
	<hr/> 10, 000. 00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

## APPROPRIATIONS.

The following appropriations have been made:

June 14, 1880.....	\$10, 000. 00	March 3, 1899.....	\$10, 000. 00
March 3, 1881.....	25, 000. 00	June 13, 1902 (allotted) .....	2, 176. 98
August 2, 1882.....	25, 000. 00		<hr/> 241, 926. 98
July 5, 1884.....	20, 000. 00	Amount transferred to con-	
August 5, 1886.....	18, 750. 00	solidated appropriation	
August 11, 1888.....	30, 000. 00	under act June 13, 1902...	167. 03
September 19, 1890.....	30, 000. 00		<hr/> Total .....
July 13, 1892.....	35, 000. 00		241, 759. 95
August 18, 1894.....	20, 000. 00		
June 3, 1896.....	16, 000. 00		

These appropriations have been applied to work under the original project of 1880, the amended project of 1884, and the further amended project of 1887.

## COMMERCIAL STATISTICS.

	Tons.		Tons.
1888 .....	285, 480	1892 .....	345, 559
1889 .....	328, 353	1893 .....	351, 390
1890 .....	418, 190	1894 .....	379, 808
1891 .....	304, 338		

Repeated efforts were made to obtain commercial statistics for years subsequent to 1894, but they could not be obtained.

It is stated that the principal line of steamers navigating this river carried 59,273 tons of freight during the year 1900, 55,951 tons during the year 1901, and 61,934 tons during the year 1902.

## (B) OCCOQUAN CREEK.

## WORK OF THE FISCAL YEAR ENDED JUNE 30, 1903.

Allotments of \$100 and \$2,500 from the amount appropriated by act of Congress of June 13, 1902, for improving York River, Occoquan, Lower Machodoc, Nandua, Aquia, and Carters creeks, Virginia, were made July 18 and September 5, 1902, respectively, to be applied to the work at Occoquan Creek.

# 1052 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

Under date of March 13, 1903, proposals were invited for furnishing and placing riprap stone in the dikes at Occoquan and Sand bars. The proposals were opened April 14, 1903, and the contract was awarded to the lowest bidder, H. P. Gilbert, of Washington, D. C., at \$1.25 per cubic yard.

The dike at Occoquan bar had been somewhat injured by freshets and ice, and on June 17, 1903, the contractor began the delivery of stone at this dike. From this time the work was prosecuted continuously to the end of the fiscal year, when it was still in progress. A total of 500 cubic yards of stone had then been delivered and placed in this dike, restoring the greater portion of it to the full height and cross section.

The sum of \$5,000 can be profitably expended during the fiscal year ending June 30, 1905, in dredging and dike construction.

## Money statement.

Allotment from appropriation of June 13, 1902.....	\$2,600.00
June 30, 1903, amount expended during fiscal year .....	222.73
July 1, 1903, balance unexpended .....	2,377.27
July 1, 1903, outstanding liabilities.....	58.00
July 1, 1903, balance available .....	2,319.27
July 1, 1903, amount covered by uncompleted contracts.....	2,250.00
(Amount (estimated) required for completion of existing project.....	17,500.00
{ Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903 .....	5,000.00
{ Submitted in compliance with requirements of sundry civil act of June 4, 1897.	

## APPROPRIATIONS.

The following appropriations have been made:

September 19, 1890.....	\$10,000.00
July 13, 1892.....	5,000.00
August 18, 1894 .....	5,000.00
June 3, 1896 .....	2,500.00
March 3, 1899.....	2,500.00
June 13, 1902 (allotted) .....	2,600.00
	27,600.00
Amount transferred to consolidated appropriation under act June 13, 1902.	272.03
Total .....	27,327.97

## CONTRACT IN FORCE.

Contractor: H. P. Gilbert, of Washington, D. C., for furnishing, delivering, and placing riprap stone in dikes.

Amount: 1,800 cubic yards, more or less.

Date of contract: April 29, 1903.

Approved: May 6, 1903.

Date for commencement: May 24, 1903; at least 250 cubic yards of stone to be delivered each week until completion of contract, except that delivery will not be required while the channel of the creek is closed by ice.

Rate: \$1.25 per cubic yard.

## COMMERCIAL STATISTICS.

[Furnished by Messrs. G. W. Hunter and Tyson Janney, Occoquan, Va.]

*Receipts and shipments by water, 1902.*

	Tons.		Tons.
Coal.....	50	Wood .....	3,450
Grain.....	720	Flour.....	100
Iron.....	4	Pine and oak piling.....	2,500
Lumber.....	25	Sand and stone.....	4,000
General merchandise.....	400		
Railroad ties.....	1,800	Total .....	13,049

*Arrivals and departures of vessels, 1902.*

Steam, drawing less than 10 feet .....	200
Sail, drawing less than 10 feet.....	162

It is reported that the work done has lessened the cost of shipping, since vessels can now load more heavily at the wharves, whereas formerly part of the cargo had to be taken to them in lighter-draft boats.

## (c) LOWER MACHODOC CREEK.

## WORK OF THE FISCAL YEAR ENDED JUNE 30, 1903.

Allotments of \$80 and \$2,100 from the amount appropriated by act of Congress of June 13, 1902, for improving York River, Occoquan, Lower Machodoc, Nandua, Aquia, and Carters creeks, Virginia, were made July 18 and September 9, 1902, respectively, to be applied to the work at Lower Machodoc Creek.

Proposals for dredging were invited November 6, and opened December 6, 1902, the work to be done under the same contract as similar dredging in Breton Bay, Maryland. The contract was awarded to the lowest bidder, John Miller, of Washington, D. C., at 17.4 cents per cubic yard, measured in scows.

Dredging under the above contract was begun May 4 and completed May 28, 1903. As a result of these operations the channel 150 feet wide and 9 feet deep was completed entirely through this bar, 7,095 cubic yards of material being excavated and deposited in the bay east of Narrows Beach.

No further appropriation is required for the completion of the present project.

*Money statement.*

Allotment from appropriation of June 13, 1902 .....	\$2,180.00
June 30, 1903, amount expended during fiscal year.....	1,674.83
July 1, 1903, balance unexpended .....	505.17
July 1, 1903, outstanding liabilities .....	28.00
July 1, 1903, balance available .....	477.17



# 1054 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

## APPROPRIATIONS.

The following appropriations have been made:

July 13, 1892.....	\$3,000.00
August 18, 1894.....	3,000.00
June 3, 1896.....	1,500.00
March 3, 1899.....	1,500.00
June 13, 1902 (allotted).....	2,180.00
	<hr/>
	11,180.00
Amount transferred to consolidated appropriation under act June 13, 1902.....	175.88
	<hr/>
Total.....	11,004.12

## CONTRACT IN FORCE.

Contractor: John Miller, of Washington, D. C., for dredging.

Amount: 6,000 cubic yards, more or less.

Date of contract: December 22, 1902.

Approved: January 9, 1903.

Date for commencement: February 9, 1903.

Date for completion (including dredging in Breton Bay, Maryland, under the same contract): Within four months from date of commencement; not less than 10,000 cubic yards to be dredged per month, excepting that work may be suspended during the months of December, January, February, and March.

Rate: 17.4 cents per cubic yard.

## COMMERCIAL STATISTICS.

Repeated efforts have been made to obtain commercial statistics for this work, but without success.

## (D) NANDUA CREEK.

### WORK OF THE FISCAL YEAR ENDED JUNE 30, 1903.

An examination of the creek was made in July, 1902, which showed that much shoaling of the channel had occurred.

A project for the expenditure of an allotment from the appropriation of June 13, 1902, was submitted, and a small amount of office work was done.

No funds other than a preliminary allotment of \$50 made July 18, 1902, for the purpose of making the above examination have been allotted for this locality and no other field work has been undertaken.

### *Money statement.*

Allotment from appropriation of June 13, 1902.....	\$50.00
June 30, 1903, amount expended during fiscal year.....	47.75
	<hr/>
July 1, 1903, balance unexpended.....	2.25

## APPROPRIATIONS.

The following appropriations have been made:

June 3, 1896 .....	\$3,000.00
March 3, 1899 .....	3,000.00
June 13, 1902 (allotted) .....	50.00
	<hr/>
	6,050.00
Amount transferred to consolidated appropriation under act June 13, 1902.	28.68
Total .....	<hr/>
	6,021.32

## COMMERCIAL STATISTICS.

[Furnished by the Baltimore, Chesapeake and Atlantic Railway Company.]

*Receipts and shipments by water, 1902.*

	Tons.
Fish and oysters .....	27.5
Produce .....	4,000.5
Merchandise .....	579
Total .....	<hr/>
	4,607

## (E) AQUIA CREEK.

## WORK OF THE FISCAL YEAR ENDED JUNE 30, 1903.

A project for the expenditure of an allotment from the appropriation of June 13, 1902, was submitted, and a small amount of office work, drafting, etc., was done.

An allotment of \$100 was made July 18, 1902, for making preliminary examination of the channel. No funds have been allotted for work of improvement at this locality, and hence no field work was undertaken.

No further appropriation is requested at present.

*Money statement.*

Allotment from appropriation of June 13, 1902 .....	\$100.00
July 1, 1903, balance unexpended .....	100.00

## APPROPRIATIONS.

The following appropriations have been made for the new work:

September 19, 1890 .....	\$10,000.00
July 13, 1892 .....	5,000.00
August 18, 1894 .....	3,000.00
June 3, 1896 .....	3,000.00
June 13, 1902 (allotted) .....	100.00
	<hr/>
	21,100.00
Amount transferred to consolidated appropriation under act June 13, 1902.	463.36
Total .....	<hr/>
	20,636.64

## COMMERCIAL STATISTICS.

Repeated efforts have been made to obtain commercial statistics for this work, but without success.

## CARTERS CREEK.

## WORK OF THE FISCAL YEAR ENDED JUNE 30, 1903.

An allotment of \$7,000 from the amount appropriated by act of Congress of June 13, 1902, for improving York River, Occoquan, lower Machodoc, Nandua, Aquia, and Carters creeks, Virginia, was made on September 5, 1902, to be applied to the work at Carters Creek.

Under date of November 3, 1902, proposals were invited by public advertisement for dredging at Carters Creek under the same contract with the dredging proposed to be done in Rappahannock River and Milford Haven. The only bid received was that of John Miller, of Washington, D. C., at 28 cents per cubic yard, measured in scows. The bid was regarded as too high and was rejected. It was decided to defer action until a more favorable time. The work will be readvertised early in the ensuing fiscal year.

The sum of \$8,000 can be profitably expended during the fiscal year ending June 30, 1905, in jetty construction and dredging. It is thought that unless the jetties be built at an early date the dredged channels will soon shoal up and redredging will be necessary, thus increasing the estimated cost of the work.

*Money statement.*

Allotment from appropriation of June 13, 1902 .....	\$7,000. 00
June 30, 1903, amount expended during fiscal year .....	11. 86
July 1, 1903, balance unexpended .....	6,988. 14
{ Amount (estimated) required for completion of existing project .....	28,700. 00
{ Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903 .....	8,000. 00
{ Submitted in compliance with requirements of sundry civil act of June 4, 1897.	

## APPROPRIATION.

The following appropriation has been made:

June 13, 1902 (allotted) .....	\$7,000
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## COMMERCIAL STATISTICS, 1902.

	Furnished by H. E. Owen, Weems, Va.	Furnished by Weems Steamboat Co., Balti- more, Md.	Furnished by Carters Creek Fish Guano Co., Irving- ton, Va.
	Tons.	Tons.	Tons.
Coal .....	500	4,000	4,000
Farm produce .....	15,400	2,500	
Grain .....	103,000	1,000	
Ice .....	2,150	100	
Iron .....	2,900		
Lumber .....	30,000	1,000	
General merchandise .....	2,200		
Oysters .....	125,000	25,000	(a)
Railroad ties .....	10,000		
Wood .....	3,750	2,500	
Flour .....	6,000		
Canned goods .....	400		
Fish .....		20,000	(a)
Fertilizer .....		7,000	
Truck and fruit .....		500	
Oil .....		500	
Total .....	301,300	64,100	4,000

<sup>a</sup> Large quantities.

*Arrival and departure of vessels, 1902.*

	Furnished by H. E. Owen, Weems, Va.		Furnished by Weems Steamboat Co., Baltimore, Md.		Furnished by Carters Creek Fish Guano Co., Irving- ton, Va.	
	Number.	Tonnage.	Number.	Tonnage.	Number.	Tonnage.
Steam:						
Drawing 10 feet or more .....			600	36,000	6	1,000
Drawing less than 10 feet .....	3,830	776,000			8	2,000
Sail:						
Drawing less than 10 feet .....	4,400	100,000	100	7,000	40	3,400
Barges, flatboats, etc. ....	50	40,000	400	3,000	300	.....
Total .....	8,280	916,000	1,100	46,000	354	6,400

## L 6.

## IMPROVEMENT OF NOMINI CREEK, VIRGINIA.

## WORK OF THE FISCAL YEAR ENDED JUNE 30, 1903.

The available funds being insufficient for the economical prosecution of the work, no work of improvement was in progress during the past fiscal year.

The sum of \$12,000 can be profitably expended during the fiscal year ending June 30, 1905, in dredging and jetty construction. An appropriation of less than \$6,000 can not be economically expended at this locality.

*Money statement.*

July 1, 1902, balance unexpended .....	\$3,016.38
June 30, 1903, amount expended during fiscal year .....	282.31
July 1, 1903, balance unexpended .....	2,734.07
{ Amount (estimated) required for completion of existing project .....	35,000.00
{ Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903 .....	12,000.00
{ Submitted in compliance with requirements of sundry civil act of June 4, 1897.	

## APPROPRIATIONS.

The following appropriations have been made:

May 3, 1873 .....	\$10,000	September 19, 1890 .....	\$5,000
June 23, 1874 .....	6,000	July 13, 1892 .....	10,000
March 3, 1875 .....	5,000	August 18, 1894 .....	5,000
March 5, 1879 .....	2,500	June 3, 1896 .....	2,500
June 14, 1880 .....	5,000	March 3, 1899 .....	10,000
March 3, 1881 .....	2,000		
August 2, 1882 .....	2,000	Total .....	70,000
August 11, 1888 .....	5,000		

## COMMERCIAL STATISTICS.

*Receipts and shipments by water, 1902.*

[Furnished by Mr. J. L. Healy, Templeman Crossroads, Va.]

	Tons.		Tons.
Farm produce .....	10,300	Railroad ties .....	1,000
Grain .....	500	Wood .....	8,000
Lumber .....	700	Flour .....	50
General merchandise .....	500		
Oysters .....	300	Total .....	21,350

It is reported that the improvement made thus far has been of great benefit to navigation.

## L 7.

## IMPROVEMENT OF RAPPAHANNOCK RIVER, VIRGINIA.

## WORK OF THE FISCAL YEAR ENDED JUNE 30, 1903.

A survey of the bars above Port Royal was made in August, 1902.

Under date of November 3, 1902, proposals were invited by public advertisement for dredging at Fredericksburg and Spottswood bars, Rappahannock River, under the same contract with the dredging proposed to be done in Carters Creek and Milford Haven. The only bid received was that of John Miller, of Washington, D. C., at 33 cents per cubic yard, measured in scows. The proposal was regarded as too high and was rejected. It was decided to defer action until a more favorable time in the hope of obtaining a reasonable price for the work. The condition of the channels is such as to demand that the work be readvertised early in the ensuing fiscal year.

Proposals for Virginia pine lumber for repairing some of the dikes were invited October 22, and opened November 12, 1902. The contract was awarded to the lowest bidder, W. S. Embrey, of Fredericksburg, Va., at \$14 per one thousand feet B. M.

The United States snag boat arrived at Fredericksburg on September 27, and the crew was employed during October and a part of November in removing large trees which had grown on the fill behind the dike, and which injured the latter by swaying during high winds and freshets. The plant was prepared for the work in hand and the reconstruction of Dike No. 3, at Fredericksburg bar, was commenced in November, 1902. Operations were greatly delayed by rain, ice, cold, high tides, and freshets, of which there was an unusual number, and it was not until May, 1903, that the reconstruction of this dike was completed. Work was at once begun on Dike No. 4, at Fredericksburg bar, and was in progress at the close of the fiscal year, at which time 243 linear feet of this dike had been entirely reconstructed, and for 223 feet farther it was in various stages of progress.

The wreck of the Weems Line steamer *Richmond*, which burned and sank nearly opposite the steamboat wharf in November, 1901, was removed by the steamboat company during November and December, 1902. These operations were observed, without cost to the United States, to see that no obstruction to navigation or injury to the improvement should result.

## MAINTENANCE OF IMPROVEMENT.

Fredericksburg bar is situated near the head of tidewater, and new deposits of sand are formed by each recurring freshet to such an extent that redredging is necessary almost every year to maintain the channel in a navigable condition, and the annual reports for a number of years past have referred to the necessity of an annual appropriation of \$7,500 for the removal of these particular deposits. A tendency to gradually shoal has also been noted at Spottswood and other of the bars, but this is insignificant and will probably practically disappear when the dikes at these bars are restored to serviceable condition. The funds on hand available for dredging will suffice to afford only the most temporary relief to navigation.

The old timber dikes were built to elevations of about 6 feet above low tide, and have suffered greatly from decay, combined with the effects of ice and freshets. Portions of these dikes have been practically destroyed, permitting some of the material deposited behind them to wash back into the channel. The condition of the dikes is rapidly becoming more and more serious. Owing to the meager appropriations which have recently been made for this river, the funds have been mainly required for the maintenance of the channel at Fredericksburg, as above referred to; but little could be done toward the maintenance of the dikes or the protection of the newly made fills, and no considerable headway could be made toward the completion of the general project. The small allotment which could be spared from the last appropriation, after providing for the imperative temporary needs of navigation by dredging, is being applied to reconstructing three of the dikes most in need of attention, but there are several others in almost as bad a condition as those which have been thus selected.

The full sum of \$40,000 requested for this improvement is much needed and can be profitably expended during the fiscal year ending June 30, 1905, in dredging and dike construction and maintenance in accordance with the approved project.

*Money statement.*

July 1, 1902, balance unexpended .....	\$26,535.09
June 30, 1903, amount expended during fiscal year .....	5,293.18
July 1, 1903, balance unexpended .....	21,241.91
July 1, 1903, outstanding liabilities .....	815.00
July 1, 1903, balance available .....	20,426.91
July 1, 1903, amount covered by uncompleted contracts .....	1,806.00
Amount (estimated) required for completion of existing project .....	89,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903:	
For works of improvement .....	\$20,000.00
For maintenance of improvement .....	20,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	40,000.00

APPROPRIATIONS.

The following appropriations have been made:

March 3, 1871 .....	\$15,000	August 5, 1886 .....	\$20,000
June 10, 1872 .....	15,000	August 11, 1888 (\$15,000, of which \$3,000 was for Urbana) .....	12,000
March 3, 1873 .....	15,000	September 19, 1890 .....	15,000
June 23, 1874 .....	7,000	July 13, 1892 .....	20,000
March 3, 1875 .....	5,000	August 18, 1894 .....	10,000
August 14, 1876 .....	10,000	June 3, 1896 .....	8,000
August 18, 1878 .....	13,500	March 3, 1899 .....	15,000
March 3, 1879 .....	10,000	June 13, 1902 .....	25,000
June 14, 1880 .....	25,000		
March 3, 1881 .....	15,000		
August 2, 1882 .....	17,000	Total .....	292,500
July 5, 1884 .....	20,000		

# 1060 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

## CONTRACT IN FORCE.

Contractor: W. S. Embrey, of Fredericksburg, Va., for Virginia pine lumber.  
Amount: 129,000 feet B. M., more or less.  
Date of contract: November 18, 1902.  
Date for commencement: December 8, 1902; delivery to be in such quantities and at such times as required by the engineer officer in charge.  
Rate: \$14 per 1,000 feet B. M.

## COMMERCIAL STATISTICS.

### *Receipts and shipments by water, 1902.*

[Furnished by William D. Scott, Fredericksburg, Va.]

	Tons.		Tons.
Coal .....	2,680	Tobacco .....	85
Flour .....	5,150	Wood .....	24,100
Farm produce .....	24,170	Fish .....	390
Grain .....	50,100	Fertilizer .....	9,870
Ice .....	1,250	Canned goods and vegetables .....	4,390
Lumber .....	8,600	Manufactures .....	2,000
General merchandise .....	15,870		
Oysters .....	25,610	Total .....	244,365
Railroad ties .....	70,100		

### *Arrival and departure of vessels, 1902.*

Steam:	
Drawing 10 feet or more .....	820
Drawing less than 10 feet .....	760
Sail:	
Drawing 10 feet or more .....	1,380
Drawing less than 10 feet .....	620
Barges, flatboats, etc. ....	620

It is reported that the work done on this improvement has greatly reduced freight rates, both by rail and water. A new line of steamers has been added during the year, and an additional boat is being run by the Weems Line.

## L 8.

### IMPROVEMENT OF URBANA CREEK, VIRGINIA.

#### WORK OF THE FISCAL YEAR ENDED JUNE 30, 1903.

Dredging within the creek, under contract with John Miller, of Washington, D. C., was begun November 17 and completed November 29, 1902. A total of 3,049.7 cubic yards of material was excavated and properly deposited, adding materially to the capacity of the turning basin.

The sum of \$10,000 can be profitably expended during the fiscal year ending June 30, 1905, in dredging and in construction of the jetty for the maintenance of the outer channel, which will otherwise soon shoal.

### *Money statement.*

July 1, 1902, balance unexpended .....	\$778. 00
June 30, 1903, amount expended during fiscal year .....	778. 00
<hr/>	
{ Amount (estimated) required for completion of existing project .....	36,500. 00
{ Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903 .....	10,000. 00
{ Submitted in compliance with requirements of sundry civil act of June 4, 1897.	

## APPROPRIATIONS.

The following appropriations have been made:

March 3, 1879 .....	\$5,000	September 19, 1890 .....	\$3,000
June 14, 1880 .....	2,500	July 13, 1892 .....	3,000
March 3, 1881 .....	4,000	August 18, 1894 .....	3,000
August 2, 1882 .....	4,000	June 3, 1896 .....	3,000
August 11, 1888 (included in an appropriation of \$15,000 for Rappahannock River) .....	3,000	March 3, 1899 .....	3,000
		Total .....	33,500

## CONTRACT IN FORCE.

Contractor: John Miller, of Washington, D. C., for dredging.

Amount: 3,000 cubic yards, more or less.

Date of contract: October 29, 1900.

Approved: November 14, 1900.

Date for commencement: December 15, 1900.

Date for completion (including dredging in York, Mattaponi, and Pamunkey rivers, and Milford Haven, Virginia, under the same contract): Within fifteen months from date of commencement; not less than 7,000 cubic yards to be dredged per month. The contractor was allowed a reasonable additional time for completion of the work.

Rate: 24 cents per cubic yard.

## COMMERCIAL STATISTICS.

*Receipts and shipments, 1902.*

Articles.	Reported by Mr. F. C. Bristow.	Reported by Mr. J. D. Gressitt.
	<i>Tons.</i>	<i>Tons.</i>
Coal .....	4,550	5,000
Farm produce .....	25,100	28,000
Grain .....	70,000	11,000
Ice .....	7,500	8,000
Iron .....	500	600
Lumber .....	95,000	100,000
General merchandise .....	155,000	170,000
Oysters .....	75,000	80,000
Railroad ties .....	30,000	40,000
Wood .....	75,000	90,000
Flour .....	9,500	5,000
Guano .....	500	500
Total .....	547,650	538,100

*Arrivals and departures of vessels, 1902.*

Class.	Reported by Mr. F. A. Bristow.	Reported by Mr. J. D. Gressitt.
Steam:		
Drawing 10 feet or more .....	1,300	1,200
Drawing less than 10 feet .....	1,700	1,800
Sail:		
Drawing 10 feet or more .....	700	800
Drawing less than 10 feet .....	3,700	4,000
Barges, flatboats, etc .....	420	400

These statistics are not regarded as entirely correct.

A daily mail steamer line running from Carters Creek or Irvington to Urbana was established in 1896. It is reported that there have recently been established two new steamboat lines from Fredericksburg, Va., to this creek and that the Weems Steamboat Company sends two steamers a week into the creek now. The work done on this improvement has greatly reduced freight rates and permitted the use of larger vessels.



## L 9.

## IMPROVEMENT OF HARBOR AT MILFORD HAVEN, VIRGINIA.

## WORK OF THE FISCAL YEAR ENDED JUNE 30, 1903.

Dredging on the shoal within the haven, under contract with John Miller, of Washington, D. C., was begun September 13, 1902, and completed November 13, 1902. The total amount of material dredged under this contract was 12,587.4 cubic yards, which resulted in providing a channel at least 10 feet deep and 175 feet wide through the inner bar, greatly facilitating the passage of steamers and vessels.

Under date of November 3, 1902, proposals were invited by public advertisement for dredging at Milford Haven under the same contract with the dredging proposed to be done in Rappahannock River and Carters Creek, under the appropriation of June 13, 1902. The only bid received was that of John Miller, of Washington, D. C., at 33 cents per cubic yard, measured in scows. The bid was regarded as too high and was rejected. It was decided to defer action until a more favorable time. The work will be readvertised early in the ensuing fiscal year.

No further appropriation is regarded as necessary.

*Money statement.*

July 1, 1902, balance unexpended .....	\$11,641.97
June 30, 1903, amount expended during fiscal year .....	2,392.75
July 1, 1903, balance unexpended .....	9,249.22

## APPROPRIATIONS.

The following appropriations have been made:

March 3, 1899.....	\$12,500.00
June 13, 1902 .....	5,000.00
Total .....	17,500.00
Amount of judgment recovered.....	3,032.97
Total .....	20,532.97

## CONTRACT IN FORCE.

Contractor: John Miller, of Washington, D. C., for dredging.

Amount: 12,000 cubic yards, more or less.

Date of contract: October 29, 1900.

Approved: November 14, 1900.

Date for commencement: December 15, 1900.

Date for completion (including dredging in York, Mattaponi, and Pamunkey rivers and Urbana Creek, Virginia, under the same contract): Within fifteen months from date of commencement; not less than 7,000 cubic yards to be dredged per month. The contractor was allowed a reasonable time for completion of the work.

Rate: 16 cents per cubic yard.

# APPENDIX L—REPORT OF LIEUT. COL. ALLEN. 1063

COMMERCIAL STATISTICS, 1902.

[Furnished by Baltimore, Chesapeake and Atlantic Railway Company.]

	Tons.		Tons.
Coal.....	13	Mill products.....	109
Farm produce.....	238	Fertilizer.....	36
Grain.....	45	Live stock.....	72
Ice.....	10	Fish.....	138
Wood.....	3	Crabs.....	107
General merchandise.....	852	Oysters.....	16,670
Flour.....	220		
Lumber.....	10	Total.....	18,553
Iron.....	30		

## Vessels arriving and departing, 1902.

Class.	Number.	Tonnage.
Steam, drawing less than 10 feet.....	4	2,400
Sail:		
Drawing 10 feet or more.....	12	1,600
Drawing less than 10 feet.....	80	5,000
Total.....	96	9,000

## L 10.

### IMPROVEMENT OF MATTAPONI RIVER, VIRGINIA.

#### WORK DONE DURING THE FISCAL YEAR ENDED JUNE 30, 1903.

The available funds being practically exhausted, no work of improvement was in progress during the year.

On June 30, 1903, an allotment of \$800 was made from the emergency appropriation of June 6, 1900, for the purpose of removing snags, logs, and overhanging trees from the river. This will be done early in the ensuing year, and as soon as the United States snagboat can be spared from other work upon which it is now engaged.

The sum of \$4,000 can be profitably expended during the fiscal year ending June 30, 1905, in dredging and removal of snags, logs, and overhanging trees. An appropriation of less than \$3,000 can not be economically expended at this locality except in snagging.

#### Money statement.

July 1, 1902, balance unexpended.....	\$637.29
Allotment from appropriation of June 6, 1900.....	800.00
	<hr/>
June 30, 1903, amount expended during fiscal year.....	1,437.29
	159.52
	<hr/>
July 1, 1903, balance unexpended.....	1,277.77
	<hr/>
{ Amount (estimated) required for completion of existing project.....	42,300.00
{ Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903.....	4,000.00
{ Submitted in compliance with requirements of sundry civil act of June 4, 1897.	

# 1064 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

## APPROPRIATIONS.

The following appropriations and allotment have been made:

June 4, 1880.....	\$2, 500	July 13, 1892.....	\$4, 000
March 3, 1881.....	3, 300	August 18, 1894.....	4, 000
July 5, 1884.....	2, 500	June 3, 1896.....	2, 500
August 5, 1886.....	5, 000	June 30, 1903 (allotted).....	800
August 11, 1888.....	3, 000		
September 19, 1890.....	3, 000	Total .....	30, 600

## COMMERCIAL STATISTICS.

### *Receipts and shipments, 1902.*

	Tons.		Tons.
Farm produce.....	10, 025	Wood .....	50, 000
Grain.....	50, 000	Flour.....	10, 000
Lumber.....	20		
General merchandise .....	50, 000	Total .....	<sup>a</sup> 270, 045
Railroad ties .....	100, 000		

### *Vessels arriving and departing, 1902.*

Steam, drawing less than 10 feet.....	200
Sail, drawing less than 10 feet.....	20
Barges, flatboats, etc.....	1, 000
Total .....	1, 220

Repeated efforts were made to obtain commercial statistics for the years 1895-1898, but they could not be procured. It is stated that the commerce of the river in 1899 was approximately 44,700 tons.

## L II.

### IMPROVEMENT OF PAMUNKEY RIVER, VIRGINIA.

#### WORK DONE DURING THE FISCAL YEAR ENDED JUNE 30, 1903.

The available funds being practically exhausted, no work of improvement was undertaken during the fiscal year.

On April 28, 1903, an allotment of \$1,000 was made from the emergency appropriation of June 6, 1900, for the purpose of removing snags, logs, and overhanging trees from the river. This will be done early in the ensuing year, and as soon as the United States snag boat can be spared from other work upon which it is now engaged.

During the year about 10,000 cubic yards of material were dredged from in front of the docks of the Southern Railway Company at West Point, Va., and deposited on the opposite side of the Pamunkey, adjacent to the marsh. This work was done, under permit, at the expense of the said company.

The sum of \$3,500 can be profitably expended during the fiscal year ending June 30, 1905, in dredging and removal of snags, logs, and wrecks. An appropriation of less than \$3,000 can not be economically expended at this locality except in snagging.

<sup>a</sup> The only statistics obtained; the amount is believed to be in excess of the actual tonnage of the river.

*Money statement.*

July 1, 1902, balance unexpended .....	\$570. 50
Allotment from appropriation of June 6, 1900 .....	1,000. 00
	<hr/>
June 30, 1903, amount expended during fiscal year .....	1,570. 50
	186. 07
	<hr/>
July 1, 1903, balance unexpended .....	1,384. 43
	<hr/>
{ Amount (estimated) required for completion of existing project .....	7,000. 00
{ Amount that can be profitably expended in fiscal year ending June 30,	
1905, in addition to the balance unexpended July 1, 1903.....	3,500. 00
{ Submitted in compliance with requirements of sundry civil act of June	
4, 1897.	

## APPROPRIATIONS.

The following appropriations and allotment have been made:

June 14, 1880 .....	\$2,500	July 13, 1892.....	\$3,000
March 3, 1881 .....	2,500	August 18, 1894 .....	2,000
August 2, 1882 .....	2,500	June 3, 1896 .....	2,000
August 5, 1886 .....	5,000	April 28, 1903 (allotted) .....	1,000
August 11, 1888 .....	3,000		
September 19, 1890 .....	3,000	Total .....	26,500

## COMMERCIAL STATISTICS.

Repeated efforts were made to obtain commercial statistics for 1902, but they could not be obtained.

It is stated that the commerce of the river in 1899 amounted to approximately 44,600 tons, consisting of wood, lumber, grain, ties, coal, and general merchandise, carried in sailing vessels.

## L 12.

## IMPROVEMENT OF JAMES RIVER, VIRGINIA.

## WORK OF THE FISCAL YEAR ENDED JUNE 30, 1903.

During the fore part of the year operations consisted in care of floating and other property, and in examining and sounding channels and mapping the result with a view to continuing the improvement. Examination of Dutch Gap Canal was made, a portion of the left bank of the bluff having slid into the canal on the 13th of May, 1902. Slides from the bluff had occurred in past years.

A project for expenditure of the appropriation of June 13, 1902, for improving James River, was submitted to the Chief of Engineers, under date of August 22. The item of the act containing this appropriation is as follows:

Improving James River, Virginia: Continuing improvement, and for extending the improvement of James River to the head of navigation at the docks, in accordance with the report submitted in House Document Numbered Two hundred and thirty-four, Fifty-sixth Congress, first session, three hundred thousand dollars: *Provided*, That no part of said amount shall be expended for turning basins or areas mentioned in said report: *And provided further*, That not more than one-half of said appropriation shall be expended for the improvements above the city line of the city of Richmond.

The project provided for the following work:

Enlarging the channel between Jetty B and the Chesapeake and Ohio Railroad wharf from the dimensions of 100 feet in width by 18 feet in depth to 140 feet by 18 feet.

Removal of rocks and sand reefs from the improved channel between the lower city line of Richmond, Va., and the head of Richmond Bar, 7 miles below the city.

Widening the channel between the Chesapeake and Ohio Railroad wharf and Jetty 26 from 100 feet to 150 feet.

Removal of the fill-back between Jetties 26 and 30.

Construction of training dike and jetties in the vicinity of Goode Rocks.

Shortening Jetties 16½ to 22, inclusive.

Improving Warwick reach, by constructing jetties and enlarging channel by dredging to 200 feet by 18 feet.

Enlarging the low-water section of Dutch Gap Canal from 180 feet wide by 18 feet deep to 300 feet wide by 22 feet deep, increasing its area about 50 per cent by giving an area of 9,440 square feet below mean low water, to grade the bluff above low water on left bank to a slope of about 1 on 2½, to construct a timber buttress at the toe of the sloped bluff and a retaining bulkhead in extension of the buttress at its downstream end to receive excavation from the canal, and to protect the sloped bank to a sufficient height above mean low water with a facing of stone riprap laid on a bed of spalls about 6 inches thick.

Repairing jetties and driving marking piles.

Dredging in front of United States engineer wharf.

The approved full project for the work above the lower city line of Richmond calls for a width of channel of 200 feet. The width of 75 feet is but the commencement of the improvement.

Proposals for proceeding with the foregoing work, excepting that for widening the channel through Dutch Gap Canal, were invited under advertisement dated December 1, 1902. The work for improving Dutch Gap, as described, was not included in the advertisement, as the execution of that part of the project was to be held in abeyance until title to the land where the canal had been cut, and that which it was proposed to use for its enlargement, could be acquired by the United States. This matter was reported as in a state of forwardness at the close of the fiscal year.

The section of the channel of Dutch Gap Canal is too small to permit the passage of the volume of freshets, and the old river channel, which it supplanted, is now much filled up. The bluff slide in the canal, of May, 1902, probably largely the result of scour, shows the necessity for the proposed enlargement as well as of prevention of scour by protection of the toe of the bluff after its face shall have been shaped and sloped. The sloping of the face of the bluff will serve to enlarge the area for freshet discharge, and, together with the protection of the toe, will serve to prevent subsidence of the bluff. The increase in width of the section, including slope, will also enable vessels approaching the canal from above and below to be more readily seen, one from the other.

A contract was entered into February 4, 1903, with Mr. J. Clements Shafer, of Richmond, Va., for the work of improvement from the docks at Richmond to Warwick reach. This contract was approved

by the Chief of Engineers March 4. Work under the contract began April 4. The rate of progress has not been as great as was expected, but the contractor has been making improvements in his plant by which he expects to bring its efficiency up to the mark.

The contract work of the year done thus far has consisted in excavation on the line between the lower city line and the docks, and in jetty work below the city.

Considerable shoaling has occurred in Richmond Harbor during the past year or more. Part of this shoaling is attributed to the effect of the cofferdam constructed by the William R. Trigg Shipbuilding Company. The permit of the War Department, for placing the dam, granted in the summer of 1901, contained the condition that the dam (a temporary one) should be completely removed at the expense of the company upon the completion of the ship lock to whose construction it pertained. The ship lock has not been completed. The dam has been largely used, and is now used in connection with the building of craft for the War and Navy Departments. As soon as the United States vessels are completed and removed from the dam, action will have to be taken with respect to the effect of the dam upon the channel.

With this is an extract report of Mr. S. H. Yonge, assistant engineer, containing valuable information in detail.

*Money statement.*

July 1, 1902, balance unexpended .....	\$330,050.96
June 30, 1903, amount expended during fiscal year .....	18,212.14
July 1, 1903, balance unexpended .....	311,838.82
July 1 <sup>st</sup> 1903, outstanding liabilities .....	1,240.00
July 1, 1903, balance available .....	310,598.82
July 1, 1903, amount covered by uncompleted contracts .....	232,082.00
{ Amount (estimated) required for completion of existing project .....	3,742,443.15
{ Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903 .....	300,000.00
{ Submitted in compliance with requirements of sundry civil act of June 4, 1897.	

APPROPRIATIONS.

The following appropriations have been made for this work:

July 11, 1870 .....	\$50,000	July 5, 1884 .....	\$75,000
March 3, 1871 .....	50,000	August 5, 1886 .....	112,500
June 8, 1872 .....	50,000	August 11, 1888 .....	225,000
March 3, 1873 .....	75,000	September 19, 1890 .....	200,000
June 23, 1874 .....	50,000	July 13, 1892 .....	200,000
March 3, 1875 .....	50,000	August 18, 1894 .....	100,000
August 14, 1876 .....	60,000	June 3, 1896 .....	120,000
June 18, 1878 .....	70,000	March 3, 1899 .....	150,000
March 3, 1879 .....	75,000	June 13, 1902 .....	300,000
June 14, 1880 .....	75,000		
March 3, 1881 .....	60,000	Total .....	2,222,500
August 2, 1882 .....	75,000		

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## CONTRACT IN FORCE.

Contractor: J. Clements Shafer, of Richmond, Va., for dredging, removing rock, constructing, repairing, and degrading jetties, and constructing dikes in James River, Virginia.

Estimated amount of contract: \$236,977.

Date of contract: February 4, 1903.

Approved: March 4, 1903.

Date for commencement: April 5, 1903.

Date for completion: April 5, 1905.

## COMMERCIAL STATISTICS.

*Receipts and shipments by water during calendar year 1902.*

	Port of Richmond, Va.			Points on James River other than Richmond, Va.			Total tonnage.
	Receipts.	Shipments.	Amount.	Receipts.	Shipments.	Amount.	
Brick		54	54	1,119	a 17,417	18,536	18,590
Coal	13,647	22	13,669	a 4,480	300	4,780	18,449
Cement, lime, etc.	7,083	35	7,118	430	20	450	7,568
Cattle				44	72	116	116
Cord wood	1,033	3,008	4,041	a 750	30,395	31,145	35,186
Fertilizer and fertilizer material	15,769	560	16,329	2,272		2,272	18,601
Flour				300	23	323	823
Fish and oysters	765		765	56	100	156	921
Fruit				25	76	101	101
Groceries				2,530		2,530	2,530
Grain	1,981	396	2,377	111	1,100	1,211	3,588
Hay, straw, etc.	186		186	331	995	1,326	1,512
Hogs				12	50	62	62
Horses				200	90	290	290
Ice				472	50	522	522
Lumber	2,411	4,954	7,365	1,428	163,167	164,595	171,960
Logs	50,827	1,070	51,897		5,757	5,757	57,654
Machinery	12	24	36	98	10	108	144
Oil	31,695		31,695	72		72	31,767
Peanuts				31	1,268	1,299	1,299
Potatoes	193		193	39	40	119	312
Railroad ties		11,336	11,336		10,833	10,833	22,169
Sand	24,051		24,051	10		10	24,061
Unclassified freight	77,000	48,302	125,302	4,601	1,534	6,135	131,437
Vegetables	72		72		76	76	148
Total	226,725	69,761	296,486	19,411	233,413	252,824	549,310

a Partly estimated, no replies being received from some of those to whom application for statistics was twice made. The amounts reported for 1900 were used as follows:

Receipts.	Tons.
Coal	4,000
Cord wood	750
Total	4,750
Shipments: Brick	17,417

*Arrival and departure of vessels during the calendar year 1902.*

	Port of Richmond, Va.	
	Number.	Tonnage.
Steam, drawing 5 to 16 feet	1,470	1,506,210
Sail, drawing 4 to 17 feet	316	60,638
Barges, etc.	895	152,288
Total	2,681	1,719,136

Returns of arrivals and departures for vessels for points on James River below Richmond, Va., are too incomplete for report.

No new lines of steamers were established. The Old Dominion Steamship Company replaced older vessels with two new packet boats of about 1,100 tons burden, viz, the *Berkeley* and the *Brandon*.

REPORT OF MR. SAMUEL H. YONGE, ASSISTANT ENGINEER.

UNITED STATES ENGINEER OFFICE,  
Richmond, Va., July 18, 1903.

COLONEL: I have the honor to submit my report of operations pertaining to improving James River, Virginia, for the fiscal year ending June 30, 1903.

\* \* \* \* \*

The plant furnished by the contractor for carrying on the work consists of 1 Osgood dipper dredge, which has developed a capacity of excavating 100 cubic yards of sand per hour, 1 suction dredge, with a rated hourly capacity of 125 cubic yards at a 10 per cent saturation, 3 deck scows, with a capacity aggregating 1,460 tons, 3 bottom dump scows, with a capacity aggregating 616 tons, and 1 steam pile driver.

As the necessity for improving the reach between the James River and Kanawha Canal ship lock and the lower city line of Richmond, Va., was greater than for any of the other localities included in the project, work was begun there and consisted of opening a channel between the mouth of Gillie's Creek and opposite the upper end of the Old Dominion wharf about 50 feet wide, with a least depth of 9 feet. It is proposed to complete the above channel to the James River and Kanawha Canal ship lock, which is at the lower end of the William R. Trigg Shipbuilding Company's yards, as soon as possible, by giving it a sufficient width and depth to accommodate the U. S. cruiser *Galveston* and a suction dredge for the United States engineer department, which the above firm contracted to furnish to the United States.

The material excavated in opening the above channel, consisting almost entirely of sand, was barged 3.3 miles below the city of Richmond to Warwick Reach, and conveyed ashore and deposited between the jetties.

On account of the means used by the contractor for performing the above work, being inadequate for disposing of the material as rapidly as it was excavated, the latter branch of the work has been retarded, and the progress made in proceeding with it has been unsatisfactory. Until June 6 wheelbarrows were used for conveying the excavated material ashore. After the above date a suction dredge was employed, the material being dumped from scows into a basin excavated by the contractor. The basin is surrounded with a bulkhead of sheet piling. The suction dredge, on account of imperfect details, proved inefficient. At the close of the fiscal year several alterations had been made which improved its efficiency, without, however, making it entirely satisfactory. Other changes in the above machine are now in progress which are calculated to improve it.

The volume of material excavated from the channel amounts to 13,883.82 cubic yards of sand and 1.15 cubic yards of hard rock. All of the former has been conveyed ashore, an average distance of 180.6 feet, and deposited between Jetties 64 and 68 and 72 and 76. The hard rock was deposited on Jetty 66 and the dike between Jetties 64 and 66.

In addition to the above-described work the following quantities of material were excavated in degrading jetties: 533.51 cubic yards earth excavation and 182.78 cubic yards hard rock.

The contractor was notified, under date of May 26, 1903, to begin the work of dike and jetty construction. The above work was begun on June 16 and comprised the construction of the shore ends of Jetties 63½, 65½, and 67½.

#### CONDITION OF THE CHANNEL.

The Annual Report of the Chief of Engineers for 1902, Volume II, page 1104, contains a description of the conditions obtaining in June, 1902, in the reach of river between the James River and Kanawha Canal ship lock and the lower city line of Richmond, locally known as Richmond Harbor. The above description showed that the part of the harbor above Gillies Creek, a distance of about 1,400 feet, was almost entirely occupied by a shoal, there being available for vessels only a narrow channel immediately adjacent to the wharves. The original cause of the shoaling was explained in the above annual report.

As during the first eight months of the fiscal year the city of Richmond did not carry on any dredging in the harbor, its condition became worse, and formed the foundation of several complaints from ship owners.

It has been the custom for many years for the city to maintain by dredging in the above locality a sufficient depth of water to accommodate shipping. During the past two or three years the city's dredging plant became inefficient, and finally unserviceable. About a year ago all attempts by the city to keep the harbor open were discontinued. In March, 1903, the city resumed dredging between the city wharves and the established port-warden line which forms the northern boundary



## 1070 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

of the channel on which work was begun by the United States in April, 1903, as above described.

\* \* \* \* \*

From an examination of the river below the lower city line of Richmond in June, 1903, the following were learned to be the conditions of the several reaches referred to:

Between the lower city line and Jetty B the channel excavated to 18 feet deep by 100 feet wide between October, 1899, and June, 1901, has been maintained.

In the upper part of the reach between Jetty B and the upper end of the Goode Rocks section there has been a fill at some points of from 1 to 3 feet. In the lower part of the same reach the channel has deepened slightly. The ruling depth in this reach is 16½ feet.

But slight changes have occurred in the Goode Rocks section. They consist of further shoaling of the fill-back, formed in 1901, between Jetties 26 and 30. The ruling depth in the section is 18 feet.

There has been no change of channel on the upper half of Richmond Bar section. On the lower half the depth has increased by one-half foot. The ruling depth is 18 feet.

The ruling depth on Randolph flats is 19½ feet, a decrease of about one-half foot.

The ruling depth on Warwick Reach has increased about one-half foot, or to 17½ feet.

Below Warwick Reach the ruling depth is 18 feet.

There has been no examination of the shoals of the river below Falling Creek except Goose Hill flats, where a least depth of water of 17.7 feet was found. The ruling depth of James River, therefore, below the city of Richmond, is 16½ feet, which obtains in the reach between Jetty B and the upper end of the Goode Rocks section.

## FRESHETS.

There were 14 freshets during the year. The heights they attained and the periods of their duration are subjoined.

*James River freshets, observed at United States engineer-wharf opposite Richmond, Va., from July 1, 1902, to June 30, 1903, inclusive.*

Date of crest.	Elevation of crest above gauge zero.	Freshet period (approximate).	Date of crest.	Elevation of crest above gauge zero.	Freshet period (approximate).
1902.	<i>Feet.</i>	<i>Days.</i>	1903.	<i>Feet.</i>	<i>Days.</i>
October 6.....	14.80	2½	January 31.....	6.30	7½
October 13.....	6.24	1½	February 7.....	7.10	5½
November 27.....	6.57	3½	February 18.....	13.70	6
December 4.....	7.40	2½	March 2.....	10.80	4½
December 6.....	8.10	3½	March 24.....	15.10	6½
			March 31.....	10.10	5½
1903.			April 14.....	9.80	5½
January 4.....	13.30	5½	June 8.....	16.20	5½

## MISCELLANEOUS.

An examination of the channel on Goose Hill flats was made January 28 and 29, on account of the grounding on the above shoals of the steamship *Ydun*, reported as drawing 16½ feet of water, bound for Richmond, Va. The above examination showed that the least depth of water in the above channel, which was excavated to a depth of 18 feet in 1895, was 17.7 feet. The probable cause of the grounding of the *Ydun* was that its pilot followed the buoys, some of which do not mark the position of the channel excavated by the Government.

On March 30 the schooner *Melvin Phillips* capsized about one-half mile above Fergusson's wharf in 13 feet of water and dumped its deck load of brick. The wreck was visited on April 20 and report thereon submitted. The schooner and its dumped cargo were removed by the owners on May 8. Subsequent examination at the above point showed that nearly all of the brick had been removed, the few remaining not being sufficient to constitute an obstruction to navigation.

\* \* \* \* \*

Very respectfully, your obedient servant,

SAML. H. YONGE,  
Assistant Engineer.

Lieut. Col. CHAS. J. ALLEN,  
Corps of Engineers.

## L 13.

## PROTECTION OF JAMESTOWN ISLAND, VIRGINIA.

## WORK OF THE FISCAL YEAR ENDED JUNE 30, 1903.

No work was done. The wall is in good condition.

*Money statement.*

July 1, 1902, balance unexpended .....	\$322. 15
June 30, 1903, amount expended during fiscal year .....	7. 40
July 1, 1903, balance unexpended .....	314. 75

## L 14.

## REMOVING SUNKEN VESSELS OR CRAFT OBSTRUCTING OR ENDANGERING NAVIGATION.

*Wreck of bugeye Daisy in Carters Creek, Virginia.*—A description of this wreck will be found in the Annual Report of the Chief of Engineers for 1902, pages 1108–1109.

The United States snagboat, while en route from Washington, D. C., to Fredericksburg, Va., stopped at Carters Creek and removed this wreck on September 22 and 23, 1902.

The wreck was raised as a whole by the snagboat and its tender scow and transported a distance of about one-eighth of a mile to a cove on the left side of the Western Branch of Carters Creek, where it was placed near the shore and broken up by dynamite.

The work was done by hired labor at a total cost of \$165.32.

*Wreck of unknown vessel in Potomac River, near Riverview wharf.*—On November 21, 1902, this office was informed, by indorsement of the Chief of Engineers, that an obstruction existed at this locality.

An examination of the wreck was made January 29, 1903. It lay in a depth of about 22 feet of water, about 300 feet from the Maryland shore of the river and about 1,900 feet above Riverview wharf. The name and ownership of the vessel—which was afterwards found to be a small sloop or pleasure craft—were not ascertained, nor just how or when the boat was sunk, although it appeared to have occurred rather recently.

The wreck was considered an obstruction to navigation, and an allotment of \$115 was made from the indefinite appropriation of March 3, 1899, for removing sunken vessels or craft obstructing or endangering navigation, for its removal.

The wreck was broken up February 10, 1903, and removed to the level of the surrounding bottom, by means of dynamite, five charges of 20 pounds each having been placed by a diver.

The work was done by hired labor. The cost of removal, including the examination, was \$82.27.

*Wreck of schooner Anna M. Harris in York River, Virginia.*—On November 17, 1902, this office was informed by Mr. Reuben Foster,

president and general manager of the Chesapeake Steamship Company, that the steamer *Charlotte* had, on August 30, 1902, run into and sunk the schooner *Anna M. Harris*, about 1 mile below Bell Rock light, in York River, and that the wreck constituted a serious obstruction to navigation.

On November 22, 1902, an allotment of \$40 was made from the indefinite appropriation of March 3, 1899, for removing sunken vessels or craft obstructing or endangering navigation, to defray the expenses of an examination.

The examination, made December 28, 1902, showed the wreck to be that of a small two-masted schooner about 54 feet long, 19 feet beam, and 5 feet depth of hold. The depth of water about the wreck was 27 feet and the least depth on the deck about 19 feet at low tide. The masts, though broken, projected above the water and were regarded as dangerous. When sunk the vessel was loaded with oysters.

On January 6, 1903, a report stating the results of the examination was made to the Chief of Engineers and the removal of the wreck recommended, at an estimated cost of \$300.

This recommendation was approved and on January 9 a further allotment of \$300 for the removal of the wreck was made.

The wreck was broken up between March 17 and 21, 1903, and removed to a depth of 25 feet below low tide by means of dynamite placed by a diver. The work was done by hired labor. Bad weather was encountered and difficulty was experienced in obtaining dynamite, which added considerably to the expense and rendered an additional allotment of \$70, which was made April 8, necessary for its completion.

The total cost of the work was \$401.01.

Some articles of value were recovered from the wreck. They were stored at West Point, Va., until May 9, when they were sold for a total of \$36, which sum was covered into the Treasury.

## APPENDIX M.

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### IMPROVEMENT OF HARBOR AT NORFOLK, VIRGINIA, AND ITS APPROACHES, AND OF CERTAIN RIVERS AND HARBORS IN SOUTH-EASTERN VIRGINIA AND NORTHEASTERN NORTH CAROLINA.

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REPORT FOR THE FISCAL YEAR ENDING JUNE 30, 1903, WITH OTHER DOCUMENTS RELATING TO THE WORKS. OFFICERS IN CHARGE, LIEUT. COL. JAMES B. QUINN AND CAPT. E. EVELETH WINSLOW, CORPS OF ENGINEERS.

#### IMPROVEMENTS.

- |  |   |
|--|---|
| 1. Harbor at Norfolk and its approaches, Virginia. | 8. Waterway from Norfolk, Virginia, to the sounds of North Carolina.              |
| 2. Western Branch of Elizabeth River, Virginia.    | 9. Inland water route from Norfolk, Virginia, to Albemarle Sound, North Carolina. |
| 3. Hampton Roads, Virginia.                        | 10. Edenton Bay, North Carolina.  |
| 4. Nansemond River, Virginia.                      | 11. Roanoke River, North Carolina.  |
| 5. Pagan River, Virginia.                          | 12. Removing sunken vessels or craft obstructing or endangering navigation.       |
| 6. Appomattox River, Virginia.                     |   |
| 7. Harbor at Cape Charles City, Virginia.          |   |

#### HARBOR LINES.

13. Smith Creek, Norfolk Harbor, Virginia, and Elizabeth River at Atlantic City, mouth of Smith Creek.
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ENGINEER OFFICE, UNITED STATES ARMY,  
*Norfolk, Va., July 16, 1903.*

GENERAL: I have the honor to transmit herewith my annual report upon the works of river and harbor improvement, now in my charge here, for the fiscal year ended June 30, 1903.

Very respectfully, your obedient servant,

E. EVELETH WINSLOW,  
*Captain, Corps of Engineers.*

Brig. Gen. G. L. GILLESPIE,  
*Chief of Engineers, U. S. A.*

## M 1.

IMPROVEMENT OF HARBOR AT NORFOLK AND ITS APPROACHES,  
VIRGINIA.

## (a) GENERAL IMPROVEMENT.

No actual work toward improvement was performed during the fiscal year 1903.

The expenditure reported was disbursed for a survey to secure data for the establishment of harbor lines.

The available funds and the amount recommended will be applied to dredging at such localities as may be authorized.

It is very desirable that the amount available be applied to the removal of the shoals at Pinner Point, as that work would be more beneficial to commerce than any other about the harbor now covered by estimates before Congress. To permit this to be done it is essential that the item in the act of June 13, 1902, appropriating \$20,000, for continuing improvement be amended so as to specifically direct the expenditure of this amount for dredging at Pinner Point.

*Money statement.*

July 1, 1902, balance unexpended .....	<sup>a</sup> \$23, 252. 95
June 30, 1903, amount expended during fiscal year .....	1, 287. 79
July 1, 1903, balance unexpended .....	21, 965. 16
July 1, 1903, outstanding liabilities .....	47. 08
July 1, 1903, balance available .....	21, 918. 08
{ Amount (estimated) required for completion of existing project .....	<sup>b</sup> 36, 774. 56
{ Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903 .....	36, 774. 56
{ Submitted in compliance with requirements of sundry civil act of June 4, 1897.	

## (b) HOSPITAL POINT.

The only work done was confined to investigations and examinations about the locality where the cutting away of the point is contemplated, with a view to obtaining data for the specifications for the different classes of work required. The unexpended balance will be used in cutting away the point, as proposed.

The work was advertised June 16, 1903.

<sup>a</sup> Balance July 1, 1902, included \$10,000 for "Hospital Point, Virginia."

<sup>b</sup> The appropriation of \$20,000 by act of June 12, 1902, was considered to be for new work. The Chief of Engineers having decided that there was no authority to so apply the amount it has been deducted from estimate, as a corresponding sum was added last year under the misapprehension that an increase was authorized. Estimate for completion submitted with report for 1902, also included \$183,957 for "Hospital Point, Virginia," which is now a separate section of the current report.

*Money statement.*

July 1, 1902, balance unexpended .....	\$10,000. 00
Amount appropriated by sundry civil act approved March 3, 1903 .....	183,957. 00
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June 30, 1903, amount expended during fiscal year .....	193,957. 00
	<hr/>
July 1, 1903, balance unexpended .....	192,487. 75
July 1, 1903, outstanding liabilities .....	70. 50
	<hr/>
July 1, 1903, balance available .....	192,417. 25

## APPROPRIATIONS.

Improving harbor at Norfolk, Va.:		Improving harbor at Norfolk, Va.:	
August 14, 1876 .....	\$35,000. 00	June 13, 1902 .....	\$30,000. 00
June 18, 1878 .....	50,000. 00	March 3, 1903 .....	183,957. 00
March 3, 1879 .....	75,000. 00	Improving Elizabeth River, Virginia, July 7, 1898...	360,000. 00
June 14, 1880 .....	50,000. 00		
March 3, 1881 .....	75,000. 00	Total .....	1,558,957. 00
August 2, 1882 .....	75,000. 00	Amount turned into surplus fund of the Treasury from appropriation of July 7, 1898 .....	483. 58
July 5, 1884 .....	25,000. 00		
August 5, 1886 .....	50,000. 00	Aggregate .....	1,558,473. 42
August 11, 1888 .....	50,000. 00		
September 19, 1890 .....	150,000. 00		
July 13, 1892 .....	150,000. 00		
August 18, 1894 .....	100,000. 00		
June 3, 1896 .....	100,000. 00		

## COMMERCIAL STATISTICS.

The following statistics relative to the commerce of the harbor at Norfolk, Va., during the calendar year 1902, were compiled from statements furnished by parties making shipments over this waterway.

Articles	Amount.	Value.
	<i>Tons.</i>	
Fertilizer .....	52,800	\$647,000
Brick .....	36,550	103,750
Shingles .....	20,000	114,400
Coal .....	2,434,356	6,008,383
Shells .....	19,000	15,000
Lumber .....	561,175	51,273,041
Logs .....	265,323	448,676
Grain .....	19,496	348,125
Oysters and fish .....	60,000	600,000
Miscellaneous .....	4,384,409	417,697,150
Total .....	7,853,108	477,250,525

<sup>a</sup> Included in statement for harbor at Norfolk, Va., in last annual report.

# 1076 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

## M 2.

### IMPROVEMENT OF WESTERN BRANCH OF ELIZABETH RIVER, VIRGINIA.

No operations were carried on during the fiscal year.

#### *Money statement.*

July 1, 1902, balance unexpended .....	\$333. 27
July 1, 1903, balance unexpended .....	333. 27

#### APPROPRIATION.

June 3, 1896 .....	\$45,000. 00
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#### COMMERCIAL STATISTICS.

The following statistics, indicating the commerce of the river during the calendar year 1902, were compiled from statements furnished by shippers:

Articles.	Amount.	Value.
	<i>Tons.</i>	
Logs .....	10,500	\$35,500
Manufactured lumber .....	1,250	4,800
Merchandise and produce .....	1,031,598	10,315,980
Copper ore .....	15,140	75,700
<b>Total .....</b>	<b>1,058,488</b>	<b>10,481,980</b>

#### *Vessels.*

Class.	Number.	Average draft.
		<i>Feet.</i>
Steam .....	20	9
Sail .....	150	4
Barges .....	10	6
<b>Total .....</b>	<b>180</b>	

## M 3.

### IMPROVEMENT OF HAMPTON ROADS, VIRGINIA.

No actual work toward improvement has been carried on. A contract was entered into May 18, 1903, for performing all the dredging contemplated under the adopted project, and it is anticipated that operations thereunder will be started early in the fiscal year 1904.

*Money statement.*

July 1, 1902, balance unexpended .....	\$10,000.00
Amount appropriated by sundry civil act approved March 3, 1903 .....	215,000.00
	<hr/> 225,000.00
June 30, 1903, amount expended during fiscal year .....	1,046.17
	<hr/> 223,953.83
July 1, 1903, balance unexpended .....	223,953.83
July 1, 1903, outstanding liabilities .....	376.81
	<hr/> 223,577.02
July 1, 1903, balance available .....	223,577.02
July 1, 1903, amount covered by uncompleted contracts .....	202,500.00

## APPROPRIATIONS.

Act of June 13, 1902 .....	\$10,000
Act of March 3, 1903 .....	215,000
	<hr/> 225,000
Total .....	225,000

## CONTRACT.

With Coastwise Dredging Company, for dredging, dated May 18, 1903; approved June 6, 1903; work to be commenced by August 9, 1903; date of expiration, February 9, 1905. Price, 9 cents per cubic yard, scow measurement.

## COMMERCIAL STATISTICS.

The following statistics were compiled from statements of the shippers at Newport News, Va., and indicate the traffic by way of Hampton Roads, Virginia, during the calendar year 1902:

Articles.	Amount.	Value.
Cattle.....No.	1,324	\$132,400
Grain.....tons.	271,822	5,436,440
Coal.....do.	1,387,242	4,161,726
Miscellaneous.....do.	1,004,606	49,291,900
Total.....do.	2,663,669	59,022,466

*Vessels.*

Class.	Number.	Average draft.	Average tonnage.
Steam.....*	7,110	<i>Feet.</i> 20 to 29	2,000 to 5,000
Sail.....	1,005	22 to 28	1,100 to 4,500
Total .....	8,115		

The apparent decrease in the commerce was due to falling off in shipments of one commodity—coal, due to strikes at the mines.



# 1078 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

## M 4.

### IMPROVEMENT OF NANSEMOND RIVER, VIRGINIA.

Operations on this improvement during the fiscal year were confined to the removal of channel obstructions by hired labor. The channel was cleared of these between Suffolk and Town Point, 41 logs and 4 overhanging trees having been removed.

The dredging of shoals in the river will be undertaken early in the next fiscal year under a contract dated June 19, 1903, covering this work. It is proposed to expend the available funds thereunder and the additional amount recommended in dredging.

#### Money statement.

July 1, 1902, balance unexpended .....	\$9,869.94
June 30, 1903, amount expended during fiscal year .....	547.05
July 1, 1903, balance unexpended .....	9,322.89
{ Amount (estimated) required for completion of existing project .....	1,060.00
{ Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903 .....	1,000.00
{ Submitted in compliance with requirements of sundry civil act of June 4, 1897.	

#### APPROPRIATIONS.

March 3, 1873 .....	\$15,000	July 13, 1892 .....	\$10,000
March 23, 1874 .....	10,000	August 18, 1894 .....	10,000
March 3, 1875 .....	5,000	June 3, 1896 .....	5,000
March 14, 1876 .....	5,000	March 3, 1899 .....	5,000
June 18, 1878 .....	2,000		
August 11, 1888 .....	10,000	Total .....	87,000
September 19, 1890 .....	10,000		

#### CONTRACT.

With Smith & Robinson, of New York, N. Y., dated June 19, 1903, for dredging. Price, 24½ cents per cubic yard, scow measurement.

This contract had not been approved by the Chief of Engineers, United States Army, at the close of the fiscal year.

#### COMMERCIAL STATISTICS.

The following statistics, relative to the commerce of the Nansemond River, Virginia, during the calendar year 1902, were compiled from statement of parties making shipments over this stream.

Articles.	Amount.	Value.
Lumber .....	<i>Tons.</i> 40,457	\$329,486
Merchandise .....	9,493	375,720
Oysters .....	1,000	15,000
Total .....	50,950	720,156

*Vessels.*

Class.	Number.	Average draft.	Average tonnage.
Sail .....	Not known.	<i>Fret.</i> 10	400

**M 5.**

## IMPROVEMENT OF PAGAN RIVER, VIRGINIA.

No operations were carried on during the fiscal year. The available funds and the additional amount recommended will be expended for removing the shoal places in the stream, as contemplated under the adopted project.

*Money statement.*

July 1, 1902, balance unexpended .....	\$10,870.00
June 30, 1903, amount expended during fiscal year .....	8.95
July 1, 1903, balance unexpended .....	10,863.05
{ Amount (estimated) required for completion of existing project .....	18,000.00
{ Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903 .....	18,000.00
{ Submitted in compliance with requirements of sundry civil act of June 4, 1897.	

## APPROPRIATIONS.

June 14, 1880 .....	\$5,000
March 3, 1881 .....	5,000
June 13, 1902 .....	10,870
Total .....	20,870

## COMMERCIAL STATISTICS.

The following statistics represent the commerce of Pagan River, Virginia, during the calendar year 1902:

Articles.	Amount.	Value.
	<i>Tons.</i>	
Merchandise and produce .....	41,653	\$3,123,975
Peanuts .....	32,461	2,581,844
Coal .....	1,500	6,000
Total .....	75,614	5,711,819

*Vessels.*

Class.	Number.	Average draft.	Average tonnage.
Steam .....	2	<i>Fret.</i> 64	250

## M 6.

## IMPROVEMENT OF APPOMATTOX RIVER, VIRGINIA.

## (a) MAINTENANCE.

The progress of dredging under an agreement with Mr. C. P. E. Burgwyn, at Petersburg, was seriously interfered with by the numerous freshets which occurred during the fall and spring. A total of 4,261 cubic yards, place measurement, was removed by dredging to a depth of 12 feet at mean high water, over an area 2,620 feet by 26 feet, in cutting a channel through shoals just below the harbor at Petersburg.

It is proposed to expend the available funds for dredging and maintaining the channel depth, and the amount recommended is also to be applied to the same purpose.

*Money statement.*

July 1, 1902, balance unexpended .....	<sup>a</sup> \$7,510.63
June 30, 1903, amount expended during fiscal year .....	1,516.27
July 1, 1903, balance unexpended .....	5,994.36
July 1, 1903, outstanding liabilities .....	1,069.31
July 1, 1903, balance available .....	4,925.05
Amount (estimated) required for completion of existing project .....	<sup>b</sup> 48,090.00
Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903:	
For works of improvement .....	\$20,000.00
For maintenance of improvement .....	10,000.00
	30,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

## (b) AT PETERSBURG.

This section of the improvement relates to the diversion of the river into an artificial channel. No actual work was done during the fiscal year, as the land required in connection with the work had not been acquired.

The available balance of funds for this work will be expended in carrying on the work according to plans, if the contract can be made to do it within the amount authorized.

*Money statement.*

July 1, 1902, balance unexpended .....	\$25,000.00
Amount appropriated by sundry civil act approved March 3, 1903 .....	175,000.00
June 30, 1903, amount expended during fiscal year .....	200,000.00
	1,511.04
July 1, 1903, balance unexpended .....	198,488.96
July 1, 1903, outstanding liabilities .....	6.00
July 1, 1903, balance available .....	198,482.96

<sup>a</sup>Balance July 1, 1902, given in report for 1902, included \$25,000 for "At Petersburg."

<sup>b</sup>Estimate in report for 1902, included \$175,000 for "At Petersburg."

## APPROPRIATIONS.

March 3, 1871 .....	\$50,000	August 5, 1886 .....	\$18,750
June 10, 1872 .....	40,000	August 11, 1888 .....	15,000
March 3, 1873 .....	30,000	September 19, 1890 .....	15,000
June 23, 1874 .....	30,000	July 13, 1892 .....	15,080
March 3, 1875 .....	30,000	August 18, 1894 .....	5,000
August 14, 1876 .....	30,000	June 3, 1896 .....	5,000
June 18, 1878 .....	30,000	March 3, 1899 .....	5,000
March 3, 1879 .....	20,000	June 13, 1902 .....	32,500
June 14, 1880 .....	20,000	March 3, 1903 .....	175,000
March 3, 1881 .....	20,000		
August 2, 1882 .....	35,000		
July 5, 1884 .....	25,000	Total .....	646,330

## COMMERCIAL STATISTICS.

The following statistics, relative to the commerce of the Appomattox River, Virginia, during the calendar year 1902, were compiled from statements furnished by shippers.

Articles.	Amount.	Value.
	<i>Tons.</i>	
Lumber .....	33,394	\$246,008
Grain .....	875	10,729
Coal .....	5,732	34,302
Fertilizer .....	9,442	93,420
Railroad ties .....	1,245	6,843
Peanuts .....	5,460	63,876
General merchandise .....	45,000	453,985
Total .....	100,648	909,158

*Vessels.*

Class.	Number.	Average draft.	Average tonnage.
		<i>Fect.</i>	
Steam .....	699	7	75
Sail .....	168	8	100
Barges .....	151	9	350
Total .....	1,018		

## M 7.

## IMPROVEMENT OF HARBOR AT CAPE CHARLES CITY, VIRGINIA.

The dredging of this harbor under a contract was commenced June 27, 1903, and at the close of the fiscal year 3,163 cubic yards of material, scow measurement, had been removed by dredging over an area 753 feet by 45 feet to a depth of 16 feet at mean low water, widening the entrance channel to the harbor.

The available funds and the amount recommended will be applied to dredging and jetty construction.

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## Money statement.

July 1, 1902, balance unexpended .....	\$20,292.74
June 30, 1903, amount expended during fiscal year .....	544.08
July 1, 1903, balance unexpended .....	19,748.66
July 1, 1903, outstanding liabilities .....	50.83
July 1, 1903, balance available .....	19,697.83
July 1, 1903, amount covered by uncompleted contracts.....	18,000.00
{ Amount (estimated) required for completion of existing project . ....	67,340.00
{ Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903 .....	40,000.00
{ Submitted in compliance with requirements of sundry civil act of June 4, 1897.	

## APPROPRIATIONS.

September 19, 1890 .....	\$25,000
July 13, 1892 .....	10,000
March 3, 1899 .....	20,000
June 13, 1902 .....	20,000
Total .....	75,000

## CONTRACT.

With McLean Contracting Company, of Baltimore, Md., for dredging, dated May 4, 1903, approved May 27, 1903; work to begin on or before July 20, 1903; date of expiration, June 20, 1904. Price, 32 cents per cubic yard, scow measurement.

## COMMERCIAL STATISTICS.

The following statement represents the commerce of the harbor at Cape Charles City, Va., during the calendar year 1902, and was prepared from statements supplied by lines and individuals handling the freight:

Articles.	Amount.	Value.
	<i>Tons.</i>	
Merchandise and produce .....	1,031,598	\$10,315,980

## Vessels.

Class.	Number.	Average draft.	Average tonnage.
		<i>Ft. in.</i>	
Steam .....	10	12 3	513
Barges .....	9	7 10	1,675

## M 8.

## IMPROVEMENT OF WATERWAY FROM NORFOLK, VIRGINIA, TO THE SOUNDS OF NORTH CAROLINA.

Work was carried on in the Deep Creek section of this improvement, under a contract for dredging. Three dredges worked over an area 7,500 feet by 100 feet, dredging being carried to a depth of 10 feet at mean low water. The quantity of material excavated amounted to 37,319 cubic yards, place measurement.

The available funds will be applied, when necessary, to dredging or other work of maintenance.

*Money statement.*

July 1, 1902, balance unexpended .....	\$13,351.25
June 30, 1903, amount expended during fiscal year .....	9,677.71
July 1, 1903, balance unexpended .....	3,673.54
<hr/>	
{ Amount that can be profitably expended in fiscal year ending June 30, 1905, for maintenance of improvement, in addition to the balance unexpended July 1, 1903. ....	5,000.00
{ Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899. ....	

## APPROPRIATIONS.

March 3, 1899. ....	\$25,000
Act June 6, 1900 .....	200,000
Act March 3, 1901. ....	29,870
Total .....	254,870

## CONTRACT.

With Sanford & Brooks Company, for dredging, dated July 2, 1902, approved July 21, 1902. Date of commencement of work, August 24, 1902; date of expiration, October 25, 1902. Price, 19 cents per cubic yard, scow measurement.

## COMMERCIAL STATISTICS.

The following statistics were compiled from a statement furnished by the Lake Drummond Canal and Water Company, and indicate the traffic through the Dismal Swamp Canal, Virginia and North Carolina, during the calendar year 1902:

Articles.	Amount.	Value.
Lumber.....feet B. M.	104,081,311	\$1,248,975
Shingles.....	8,125,950	41,630
Laths.....	1,468,300	14,683
Pine piles.....linear feet.	804,024	54,241
Mill logs.....feet B. M.	1,041,112	10,411
Oak piles.....linear feet.	4,502	450
Ash logs.....	5,000	2,800
Cypress piles.....linear feet.	11,720	586
Gum logs.....feet B. M.	791,541	7,915

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Articles.		Amount.	Value.
Juniper logs.....	cords.	11,796	\$68,975
Gum logs.....	do.	80	150
Banisters.....		2,000	120
Split rails.....		4,087	60
Poles.....		6,425	12,850
Phosphate.....	tons.	18,706	274,100
Coal.....	do.	2,717	10,868
Salt.....	do.	1,495	4,485
Corn.....	bushels.	86,475	43,238
Oil.....	barrels.	282	1,269
Cotton.....	bales.	174	5,555
Hay.....	tons.	40	640
Machinery.....	do.	46	9,200
Empty cans.....		10,000	500
Oats.....	bushels.	1,280	640
Iron.....	tons.	604	33,220
Bricks.....		462,000	2,772
Shells.....	bushels.	6,000	840
Sand.....	tons.	3,500	875
Wood.....	cords.	858	1,074
Iron pipe.....	tons.	259	19,435
Miscellaneous.....	do.	58,842	640,104
Total.....			2,502,161

*Vessels.*

Class.	Number.	Average draft.	Average tonnage.
Steamers.....	1,556	<i>Fert.</i> 8	51
Barges.....	867	9	248
Schooners.....	969	7	67
Yachts.....	38	6	37
Lighters.....	475	5	.....
Rafts.....	51	(a)	.....
Total.....	3,956	.....	.....

a 12,507 linear feet pine piles, 12,853 feet B. M. of mill logs, 76 linear feet cypress piles each.

**M 9.**

IMPROVEMENT OF INLAND WATER ROUTE FROM NORFOLK, VIRGINIA, TO ALBEMARLE SOUND, NORTH CAROLINA, THROUGH CURRITUCK SOUND.

The work on this improvement was confined to the removal of sunken logs in North Landing River, Currituck Sound, and North River. This work was performed by the U. S. snagboat *Roanoke*, and consisted in the removal of 543 logs, 3 snags, 4 overhanging trees, and 7 stumps.

The available funds will be applied to dredging at North River bar and the removal of sunken obstructions.

*Money statement.*

July 1, 1902, balance unexpended.....	\$23,400.32
June 30, 1903, amount expended during fiscal year.....	3,287.32
July 1, 1903, balance unexpended.....	20,113.00

{	Amount that can be profitably expended in fiscal year ending June 30, 1905, for maintenance of improvement, in addition to the balance unexpended July 1, 1903.....	2,000.00
	Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

## APPROPRIATIONS.

For Southern Branch Elizabeth River, Virginia:		
March 3, 1873.....	\$15,000	
June 23, 1874.....	10,000	
March 3, 1875.....	5,000	
August 14, 1876.....	5,000	
June 18, 1878.....	5,000	
	<u>\$40,000.00</u>	
For North Landing River, Virginia and North Carolina:		
March 3, 1879.....	25,000	
June 14, 1880.....	15,000	
March 3, 1881.....	7,500	
August 2, 1882.....	8,000	
	<u>55,500.00</u>	
For Currituck Sound, Coinjock Bay, and North River Bar, North Carolina:		
June 18, 1878.....	20,000	
March 3, 1879.....	25,000	
June 14, 1880.....	25,000	
March 3, 1881.....	30,000	
August 2, 1882.....	20,000	
July 5, 1884.....	5,000	
August 5, 1886.....	10,000	
August 11, 1888.....	7,500	
	<u>142,500.00</u>	
For inland water route, etc.:		
September 19, 1890.....	10,000	
July 13, 1892.....	9,000	
August 18, 1894.....	10,000	
June 3, 1896.....	10,000	
March 3, 1899.....	8,000	
June 13, 1902.....	23,400	
	<u>70,400.00</u>	
Total.....		308,400.00
Amount received from sale of property to other works.....		2,169.69
Aggregate.....		<u>310,569.69</u>

## COMMERCIAL STATISTICS.

The following statistics relative to the commerce of the inland water route from Norfolk Harbor, Virginia, to Albemarle Sound, North Carolina, during the calendar year 1902 were compiled from statements furnished by the Albemarle and Chesapeake Canal Company and shippers along the route:

Articles.	Amount.	Value.
	<i>Tons.</i>	
Lumber, shingles, etc.....	170,162	\$910,121
Miscellaneous.....	28,900	744,724
Total.....	<u>199,062</u>	<u>1,654,845</u>

## Vessels.

Class.	Number.	Average draft.	Average tonnage.
		<i>Feet.</i>	
Steam.....	2,084	3 to 9	57
Sail.....	527	3 to 9	46
Barges.....	714	3 to 9	109
Lighters.....			
Rafts.....	325		
Total.....	<u>3,650</u>		



## 1086 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

## M 10.

## IMPROVEMENT OF EDENTON BAY, NORTH CAROLINA.

No work was done during the fiscal year 1903. A contract for dredging will be made early in the next fiscal year, which will cover the expenditure of the funds available for this work.

*Money statement.*

July 1, 1902, balance unexpended .....	\$6, 140. 63
June 30, 1903, amount expended during fiscal year .....	297. 29
July 1, 1903, balance unexpended .....	5, 843. 34
July 1, 1903, outstanding liabilities .....	46. 30
July 1, 1903, balance available .....	5, 797. 04

## APPROPRIATIONS.

By act approved—	
June 18, 1878 .....	\$4, 000. 00
March 3, 1879 .....	1, 000. 00
July 5, 1884 .....	10, 000. 00
August 5, 1886 .....	2, 000. 00
June 13, 1902 .....	6, 000. 00
Total .....	23, 000. 00

## COMMERCIAL STATISTICS.

The following statistics relative to the commerce of Edenton Bay, North Carolina, during the calendar year 1902, were compiled from statements furnished by transportation lines handling the freight:

Articles.	Amount.	Value.
	<i>Tons.</i>	
Merchandise and produce .....	149, 246	\$1, 492, 460

*Vessels.*

Class.	Number.	Average draft.	Average tonnage.
Steam .....	Not known...	<i>Fect.</i> 6	Not known.

## M 11.

## IMPROVEMENT OF ROANOKE RIVER, NORTH CAROLINA.

The snag boat *Roanoke* was in service on this river from September 29 to November 30, 1902, and from April 14 to May 27, and June 3 to 19, 1903, for the purpose of clearing the river of obstructions. The

channel obstructions removed consisted of 20 snags, 5 logs, and 3 stumps. The overhead obstructions removed were 111 overhanging trees, which were cut down and pieces hauled out on the banks.

At Looking-Glass bar a channel 50 feet wide for 290 feet, and 25 feet wide for a further distance of 240 feet, was dredged to a depth of 6 feet at mean low water, 4,576 cubic yards, place measurement, being removed.

Proposals were invited for the construction of a riprap dam near Weldon, but none were received.

The available funds, with the additional appropriation recommended, will be applied to that work and the removal of channel obstructions.

*Money statement.*

July 1, 1902, balance unexpended .....	\$10,805.77
June 30, 1903, amount expended during fiscal year .....	4,014.61
July 1, 1903, balance unexpended .....	6,591.16
July 1, 1903, outstanding liabilities .....	143.75
July 1, 1903, balance available .....	6,447.41
{ Amount (estimated) required for completion of existing project.....	41,000.00
{ Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903.....	20,000.00
{ Submitted in compliance with requirements of sundry civil act of June 4, 1897.	

APPROPRIATIONS.

March 3, 1871 .....	\$20,000	July 13, 1892.....	\$50,000
June 10, 1872 .....	10,000	August 18, 1894 .....	30,000
March 3, 1873 .....	10,000	June 3, 1896 .....	10,000
June 23, 1874 .....	5,000		
August 2, 1882 .....	5,000	Total .....	228,000
July 5, 1884 .....	3,000	Amount received from sale of	
August 5, 1886 .....	20,000	property to other works.....	1,338
August 11, 1888 .....	40,000		
September 19, 1890 .....	25,000	Aggregate.....	229,338

COMMERCIAL STATISTICS.

The following statistics show the commerce of the Roanoke River, North Carolina, during the calendar year 1902, and were compiled from statements obtained from the shippers:

Articles.	Amount.	Value.
	<i>Tons.</i>	
Lumber.....	59,000	\$368,425.00
Logs .....	65,000	118,000.00
Shingles .....	9,500	77,296.00
Merchandise and produce .....	27,064	270,640.00
Fish.....	3,000	60,000.00
Total.....	163,564	894,361.00

*Vessels.*

Class.	Number. <sup>a</sup>	Average draft.	Average tonnage.
		<i>Feet.</i>	
Steam .....		7½	12
Sail.....		7	100
Barges.....		8	300
Lighters.....		4	50

<sup>a</sup> Not known.**M 12.**

## REMOVING SUNKEN VESSELS OR CRAFT OBSTRUCTING OR ENDANGERING NAVIGATION.

*Wreck of raft at North River bar, North Carolina.*—A portion of a raft was abandoned in North River, near North River bar, and being a menace to navigation, it was reported as an obstruction to navigation December 10, 1902, and the removal of logs which had broken adrift from the main raft was authorized December 13, 1902, at a cost not to exceed \$300. The work of removal was performed by the U. S. snag boat *Roanoke*, between January 12 and 16, 1903, at a cost of \$200.38. The logs taken out were from 16 to 30 feet in length, and were placed ashore near Newbern Landing. The number was 120.

*Wreck of Marion A. Greene.*—This wreck was that of a small schooner which sank during a storm in Albemarle Sound, about 4,500 feet south by east from Wade Point light. The wreck was in about 12 feet of water and in the path of vessels bound in and out of the Pasquotank River. Its removal was authorized December 15, 1902, and the sum of \$150 was provided to pay the attendant expenses. The U. S. snag boat *Roanoke* broke up the wreck between January 5 and 10, 1903, at a cost of \$128.49. The wreckage which was raised was placed on shore near Wade Point. Nothing of any salable value was recovered from the wreck.

*Wreck of raft in Pasquotank River, North Carolina.*—Several cribs of a raft were adrift in the Pasquotank River, near Shipyard Landing, and being an obstruction to navigation, the removal of the logs thereof was authorized January 9, 1903, at a cost of \$150. The U. S. snag boat *Roanoke* removed the obstructions between May 28 and June 3, 1903, at a cost of \$100. The number of logs removed was 161, which were put ashore on the banks.

*Wreck of Willie Lee Hall.*—The wreck of a schooner of this name sank at a wharf at Newport News, and afterwards drifted to a position off Newport News Point. Its removal was authorized April 17, 1903, and \$400 was provided April 19, 1903, for doing the work. An offer to remove the wreck for \$98 was made by a local contractor, and was accepted. An attempt was made during the month of June to destroy the wreck by blasting, which resulted in blowing away of all but a portion of the hull, which extends about 5 feet above the level of the surrounding bottom. The contractor proposes to complete the work as soon as the weather conditions are favorable.

## M 13.

ESTABLISHMENT OF HARBOR LINES ON SMITH CREEK, NORFOLK HARBOR, VIRGINIA, AND MODIFICATION OF PIERHEAD LINE ON ELIZABETH RIVER, NORFOLK HARBOR, AT THE ATLANTIC CITY BRIDGE, AT MOUTH OF SMITH CREEK.

NORFOLK, VA., *April 22, 1902.*

DEAR SIR: A wharf is being built encroaching upon the navigable channel in Smith Creek, a tributary of the Elizabeth River.

I would respectfully ask that you cause an investigation to be made and if deemed advisable to have harbor lines established in the said creek. There have been lines in this creek which were approved by the Secretary of War, as you will see by a copy of the order<sup>a</sup> which I inclose. I also inclose a copy of a permit<sup>a</sup> from the president of the board of harbor commissioners, which permit was granted me over twenty years ago. I understand that no authority has been obtained, as required by United States law, for the erection of the structure now under way in the said creek.

Very respectfully,

WILLIAM T. CORE.

The SECRETARY OF WAR.

[Second indorsement.]

OFFICE CHIEF OF ENGINEERS,

U. S. ARMY,

*April 25, 1902.*

Respectfully referred to Maj. James B. Quinn, Corps of Engineers, for report.

To be returned.

By command of Brig. Gen. Gillespie:

A. MACKENZIE,  
*Colonel, Corps of Engineers.*

[Fifth indorsement.]

ENGINEER OFFICE, U. S. ARMY,

*Norfolk, Va., June 11, 1902.*

Respectfully returned to the Chief of Engineers, U. S. Army.

A public hearing in the within matter was given by me on 4th instant, at which representatives of the owners of all property on the Atlantic City side of Smith Creek, Virginia, were present, together with the president and engineer of the local board of harbor commissioners.

The lines delineated on the tracing submitted in a separate package were unanimously agreed upon, and, as they will confine structures on the creek to such limits as to leave sufficient area for the navigation interests, I respectfully recommend their adoption.

JAMES B. QUINN,  
*Major, Corps of Engineers.*

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<sup>a</sup>Not printed.

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[Tenth indorsement.]

OFFICE CHIEF OF ENGINEERS,  
U. S. ARMY,  
*July 16, 1902.*

Respectfully returned to the Secretary of War.

Request having been made for the establishment of harbor lines on Smith Creek, Norfolk Harbor, Virginia, and it being the opinion that such lines should be established, the matter has been taken under consideration. The lines selected are delineated on the accompanying tracing<sup>a</sup> and appear to be satisfactory to all local interests.

It is recommended that these lines be approved, and that the Secretary place his approval upon the tracing, which has been prepared for his signature. This action involves a slight modification of pier lines heretofore approved for Norfolk Harbor, and is deemed desirable in order that the lines for the two localities may be properly joined.

A. MACKENZIE,  
*Acting Chief of Engineers.*

[Eleventh indorsement.]

WAR DEPARTMENT, *July 22, 1902.*

Approved as recommended by the Acting Chief of Engineers.  
By order of the Secretary of War:

JOHN C. SCOFIELD,  
*Chief Clerk.*

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<sup>a</sup> Not printed.

## APPENDIX N.

### IMPROVEMENT OF CERTAIN RIVERS AND HARBORS IN NORTH CAROLINA.

REPORT OF CAPT. E. EVELETH WINSLOW, CORPS OF ENGINEERS,  
OFFICER IN CHARGE, FOR THE FISCAL YEAR ENDING JUNE 30,  
1903, WITH OTHER DOCUMENTS RELATING TO THE WORKS.

#### IMPROVEMENTS.

- |   |   |
|---|---|
| 1. Scuppernong River, North Carolina.                             | 9. Inland Waterway, between Beaufort Harbor and New River, North Carolina.                        |
| 2. Ocracoke Inlet, North Carolina.                                | 10. New River, North Carolina.  |
| 3. Fishing Creek, North Carolina.                                 | 11. Northeast (Cape Fear) and Black rivers, and Cape Fear River above Wilmington, North Carolina. |
| 4. Pamlico and Tar rivers, North Carolina.                        | 12. Cape Fear River, North Carolina, at and below Wilmington.                                     |
| 5. Contentnia Creek, North Carolina.                              | 13. Town Creek, North Carolina.   |
| 6. Neuse and Trent rivers, North Carolina.                        |   |
| 7. Inland Waterway, between Newbern and Beaufort, North Carolina. |   |
| 8. Harbor at Beaufort, North Carolina.                            |   |

#### HARBOR LINES.

4. Trent River at Newbern, North Carolina.

UNITED STATES ENGINEER OFFICE,  
*Wilmington, N. C., July 20, 1903.*

GENERAL: I have the honor to inclose herewith \* \* \* my annual report on river and harbor works in the Wilmington, N. C., district for the fiscal year 1903. \* \* \*

Very respectfully,

E. EVELETH WINSLOW,  
*Captain, Corps of Engineers.*

Brig. Gen. G. L. GILLESPIE,  
*Chief of Engineers, U. S. A.*

#### N 1.

#### IMPROVEMENT OF SCUPPERNONG RIVER, NORTH CAROLINA.

*References.*—Annual Report for 1901, page 1543, and House Document No. 131, Fifty-sixth Congress, second session.

The work of the past year has been the removal by United States

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dredge of 32,751 cubic yards of material from a cutting across bar at mouth of river 3,350 feet long, 90 feet wide, and 9 feet deep at mean low water.

Additional appropriations of \$4,000 to complete the dredging project are recommended, and it is estimated that \$2,000 annually will be required to maintain the improvement.

## Money statement.

July 1, 1902, balance unexpended .....	\$10,000.00
June 30, 1903, amount expended during fiscal year .....	6,991.90
July 1, 1903, balance unexpended .....	3,008.10
July 1, 1903, outstanding liabilities .....	1,065.66
July 1, 1903, balance available .....	1,942.44
(Amount (estimated) required for completion of existing project .....	4,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903:	
For works of improvement.....	\$4,000.00
For maintenance of improvement.....	2,000.00
	6,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and section 7 of the river and harbor act of 1899.	

## ABSTRACT OF APPROPRIATIONS.

Prior to 1887 .....	\$10,000
June 13, 1902 .....	10,000
Total appropriated .....	20,000

## COMMERCIAL STATISTICS OF SCUPPERNONG RIVER, NORTH CAROLINA, DURING THE CALENDAR YEAR ENDING DECEMBER 31, 1902.

Class of goods.	Quantity.	Class of goods.	Quantity.
	<i>Tons.</i>		<i>Tons.</i>
Cotton .....	556	Lumber .....	11,630
Cotton seed .....	512	Shingles .....	1,055
Grains .....	1	Fertilizers .....	967
Potatoes .....	463	General merchandise .....	4,826
Vegetables .....	27	Peanuts .....	96
Cattle .....	33	Sheep .....	13
Hogs .....	67	Juniper logs .....	11,400
Poultry .....	36		
Eggs .....	104	Total .....	34,306
Timber .....	2,500		

No report last year. Number of passengers, 3,543.

## Statement of vessels navigating Scuppernong River, North Carolina, during the calendar year ending December 31, 1902.

Class of vessels.	Number.	Aggregate net tonnage.	Draft.
			<i>Fect.</i>
Steamers .....	12	365	4 to 8
Schooners .....	2	100	4
Barges .....	3	600	7

## N 2.

## IMPROVEMENT OF OCRACOE INLET, NORTH CAROLINA.

No work of improvement has been done during the year. A survey was made to ascertain the existing conditions.

It is proposed to reserve the available balance for examinations, to be made from time to time, in order to keep a complete record of the natural changes for use whenever its improvement is resumed.

No recommendation for further appropriations is made.

*Money statement.*

July 1, 1902, balance unexpended .....	\$8,473.53
Received from sales during fiscal year.....	.15
July 1, 1903, balance unexpended .....	8,473.68
July 1, 1903, outstanding liabilities .....	327.94
July 1, 1903, balance available. ....	8,145.74

## APPROPRIATED.

March 20, 1826, to March 3, 1837 .....	\$133,750.00
September 19, 1890 .....	90,000.00
July 13, 1892.....	15,000.00
	238,750.00
Less amount carried to surplus fund .....	17.60
	238,732.40
Sales .....	.15
	238,732.55

## N 3.

## IMPROVEMENT OF FISHING CREEK, NORTH CAROLINA.

*References.*—Annual Reports for 1890, page 1170; 1893, page 1377; 1900, page 1796.

The work of the past year was confined to maintenance, carried on between March 4 and May 7, extending over that portion of the stream lying between Beach Swamp and its mouth; 127 large snags, 55 stumps, 11 logs, and 120 trees were removed from the channel, and 202 trees were felled and hauled back, and 10 trees were trimmed.

The proposed application of the available balance is to maintain the natural channel as far up as Beach Swamp, and additional appropriations of \$500 annually are recommended for this purpose.



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## Money statement.

July 1, 1902, balance unexpended .....	\$2, 034. 50
June 30, 1903, amount expended during fiscal year .....	1, 488. 22
July 1, 1903, balance unexpended .....	546. 28
July 1, 1903, outstanding liabilities .....	23. 40
July 1, 1903, balance available .....	522. 88
Amount that can be profitably expended in fiscal year ending June 30, 1905, for maintenance of improvement, in addition to the balance unexpended July 1, 1903 .....	
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and section 7 of the river and harbor act of 1899.	
	500. 00

## APPROPRIATED.

September 19, 1890 .....	\$10, 000
July 13, 1892 .....	5, 000
March 3, 1899 .....	7, 750
June 13, 1902 .....	2, 000
Total .....	24,750

## COMMERCIAL STATISTICS FOR THE CALENDAR YEAR ENDING DECEMBER 31, 1902.

Class of goods.	Quantity.	Class of goods.	Quantity.
	Tons.		Tons.
Cotton .....	25	Fertilizers .....	200
Cotton seed .....	400	Peanuts .....	50
Cotton-seed meal .....	150	Total .....	4, 375
Cotton-seed hulls .....	50		
Timber .....	3, 500		

Gain over last year, 1,680 tons.

*Statement of vessels navigating Fishing Creek, North Carolina, during the calendar year ending December 31, 1902.*

Class of vessel.	Number.	Aggregate net tonnage.	Draft.
Steamer .....	1	46	1 foot to 8 inches.

## N 4.

### IMPROVEMENT OF PAMLICO AND TAR RIVER, NORTH CAROLINA.

[One river called Pamlico below and Tar above Washington, N. C.]

*References.*—History and maps: Annual Reports, 1890, page 1114; 1891, page 1347; 1896, pages 161 and 1101.

Examinations and surveys: Annual Reports, 1873, page 355; 1879,

page 700 (also H. Doc. No. 68, 45th Cong., 3d sess.); 1891, page 1429 (also H. Doc. No. 289, 51st Cong., 2d sess.); 1895, page 1365 (also H. Doc. No. 62, 53d Cong., 3d sess.); 1897, page 1425 (also H. Doc. No. 5, 55th Cong., 1st sess.).

The work of the past year has been the removal by United States dredge of 2,168 cubic yards of material from a channel 425 feet long, 60 feet wide, and 9 feet deep at mean low water across a shoal immediately above draw to wagon bridge at Washington.

Snagging operations were also carried on by United States plant between the second and fifty-seventh mileposts above Washington, in which part of the river 161 large snags, 44 stumps, 135 logs, 81 trees, 99 old piles, and 6½ cords of small snags were taken from the channel, and 149 trees and 4½ cords of brush were cut and hauled back, and 2 trees were trimmed on the banks.

The proposed application of the available balance is to complete the channel below Washington to the project depth and to maintain the natural channel above Washington.

Additional appropriations of \$6,000 annually are recommended for the purpose of maintenance.

*Money statement.*

July 1, 1902, balance unexpended .....	\$35,585.04
Received from sales during fiscal year .....	49.55
	<hr/>
	35,634.59
June 30, 1903, amount expended during fiscal year .....	4,947.13
	<hr/>
July 1, 1903, balance unexpended .....	30,687.46
July 1, 1903, outstanding liabilities .....	598.31
	<hr/>
July 1, 1903, balance available .....	30,089.15
	<hr/>
{ Amount that can be profitably expended in fiscal year ending June 30, 1905, for maintenance of improvement, in addition to the balance unexpended July 1, 1903 .....	6,000.00
{ Submitted in compliance with requirements of sundry civil act of June 4, 1897, and section 7 of the river and harbor act of 1899.	

APPROPRIATED.

Date.	Amount.	Aggregate.	Date.	Amount.	Aggregate.
July 4, 1836, to July 7, 1838.	\$10,000.00	\$10,000.00	August 11, 1838 .....	\$10,000.00	\$20,000.00
August 14, 1876 .....	15,000.00	15,000.00	September 19, 1890 .....	10,000.00	70,000.00
May 3, 1879 .....	6,000.00	21,000.00	July 13, 1892 .....	10,000.00	80,000.00
June 14, 1880 .....	9,000.00	30,000.00	August 18, 1894 .....	10,000.00	90,000.00
March 3, 1881 .....	8,000.00	38,000.00	June 3, 1895 .....	5,000.00	105,000.00
August 2, 1882 .....	10,000.00	48,000.00	March 3, 1899 .....	15,000.00	118,000.00
July 5, 1884 .....	5,000.00	53,000.00	June 13, 1902 .....	35,500.00	153,500.00
August 5, 1886 .....	5,000.00	58,000.00	Sales .....	49.55	153,549.55

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## COMMERCIAL STATISTICS FOR THE YEAR ENDING DECEMBER 31, 1902.

Class of goods.	Quantity.	Class of goods.	Quantity.
	<i>Tons.</i>		<i>Tons.</i>
Cotton .....	10,954	Turpentine, crude .....	20
Cotton seed .....	12,804	Wood .....	10,353
Cotton-seed oil .....	3,481	Timber .....	331,500
Cotton-seed meal .....	3,745	Lumber .....	297,920
Cotton hulls .....	700	Shingles .....	4,967
Tobacco, leaf .....	1,134	Fertilizers .....	23,369
Rice, rough .....	44	Machinery .....	113
Grains .....	26,150	General merchandise .....	57,935
Hay .....	2,066	Rafting gear .....	1,644
Potatoes .....	13,281	Truck .....	100
Vegetables .....	870	Coal and minerals .....	4,050
Cattle .....	700	Railroad iron .....	673
Horses .....	217	Tar .....	50
Hogs .....	21	Lime .....	200
Poultry .....	60	Peanuts .....	462
Eggs .....	1,038	Oysters, canned .....	250
Fish .....	1,772	Truck barrels .....	135
Oysters .....	16,406	Shells .....	3,250
Molasses .....	58		
Piles .....	12	Total .....	882,015
Rosin .....	11		

Loss since last year, 103,296 tons. Number of passengers, 21,795.

*Statement of vessels navigating Pamlico and Tar rivers, North Carolina, during the calendar year ending December 31, 1902.*

Class of vessels.	Number.	Aggregate net tonnage.	Draft.
			<i>Fect.</i>
Steamers .....	46	3,100	2 1/2 to 9
Sloops and schooners .....	50	1,200	2 to 8
Barges .....	37	10,175	5 to 9

### N 5.

#### IMPROVEMENT OF CONTENTNIA CREEK, NORTH CAROLINA.

*References.*—Annual Reports 1899, page 1118; 1896, page 1103; 1881, page 1009 (also H. Doc. No. 85, 46th Cong., 3d sess.).

The work of the past year was exclusively maintenance, carried on under an allotment from the appropriation for emergencies in river and harbor works, between the mouth of the creek and Snowhill; 47 large snags, 15 stumps, 26 logs, and 38 trees were removed from the channel, and 48 trees were felled and hauled back from the banks.

With the small available balance it is proposed to maintain the improvement as far as practicable.

Appropriations of \$2,000 annually are recommended for maintenance of this stream.

*Money statement.*

July 1, 1902, balance unexpended .....	\$38. 17
Allotted during fiscal year .....	500. 00
	<hr/> 538. 17
June 30, 1903, amount expended during fiscal year .....	251. 62
	<hr/> 286. 55
July 1, 1903, balance unexpended .....	286. 55
	<hr/> 288. 55
{ Amount that can be profitably expended in fiscal year ending June 30, 1905, for maintenance and improvement, in addition to the balance unexpended July 1, 1903.....	2, 000. 00
{ Submitted in compliance with requirements of sundry civil act of June 4, 1897, and section 7 of the river and harbor act of 1899.	

## APPROPRIATIONS.

Date.	Amount.	Aggregate.	Date.	Amount.	Aggregate.
March 3, 1881 .....	\$10, 000	\$10, 000	July 13, 1892 .....	\$7, 000	\$59, 000
August 2, 1882 .....	10, 000	20, 000	August 18, 1894 .....	10, 000	69, 000
July 5, 1884 .....	5, 000	25, 000	March 3, 1899 .....	2, 000	71, 000
August 5, 1886 .....	15, 000	40, 000	Allotted from emergency appropriation.....	500	71, 500
August 11, 1888 .....	5, 000	45, 000			
September 19, 1890 .....	7, 000	52, 000			

## COMMERCIAL STATISTICS FOR THE YEAR ENDING DECEMBER 31, 1902.

Class of goods.	Quantity.	Class of goods.	Quantity.
	<i>Tons.</i>		<i>Tons.</i>
Cotton .....	302	General merchandise .....	100
Cotton seed .....	120	Tar .....	10
Hay .....	60		
Timber .....	4, 500	Total .....	10, 392
Fertilizers .....	5, 300		

Loss since year 1900, 3,493 tons.

*Statement of vessels navigating Contentnia Creek, North Carolina, during the calendar year ending December 31, 1902.*

Class of vessels.	Number.	Aggregate net tonnage.	Draft.
Steamers .....	4	223	<i>Fect.</i> 2 to 4

## N 6.

## IMPROVEMENT OF NEUSE AND TRENT RIVERS, NORTH CAROLINA.

## (a) NEUSE RIVER.

*References.*—Annual Reports, 1879, page 708 (H. Doc. No. 68, 45th Cong., 3d sess.); 1891, page 1126, and 1897, page 1427 (H. Doc. No. 317, 54th Cong., 2d sess.).

The work of the year consisted of snagging between Newbern and

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the 33-mile post, in which portion of the river 36 large snags, 3 stumps, 40 logs, 19 trees, and 3 cords of small snags and brush were removed from the channel and 20 trees were felled and hauled back from the banks; and of dredging through shoal at head of Ransoms channel, a short distance below wagon bridge at Newbern, from which 6,570 cubic yards were removed from 830 feet of cutting 50 feet wide to a depth of 8 feet at dead low water.

With the available balance it is proposed to maintain the present channel as far as Goldsboro and to dredge as much as possible of the channel at and below Newbern, in accordance with the project submitted in the report on examinations and surveys, published in the Annual Report for 1897, page 1427, and also in House Executive Document No. 317, Fifty-fourth Congress, second session.

Additional appropriations are recommended of \$14,000 to complete the dredging project at and below Newbern and of \$6,000 annually to maintain the present channel above Newbern.

\* \* \* \* \*

*Money statement.*

July 1, 1902, balance unexpended .....	\$13,535.16
Received from sales during fiscal year .....	48.90
	<hr/>
	13,584.06
June 30, 1903, amount expended during fiscal year .....	6,750.46
	<hr/>
July 1, 1903, balance unexpended .....	6,833.60
July 1, 1903, outstanding liabilities .....	119.84
	<hr/>
July 1, 1903, balance available .....	6,713.76
	<hr/>
Amount (estimated) required for completion of existing project .....	91,500.00
Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903:	
For works of improvement .....	\$14,000.00
For maintenance of improvement .....	6,000.00
	<hr/>
	20,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and section 7 of the river and harbor act of 1899.	

APPROPRIATIONS.

Date.	Amount.	Aggregate.	Date.	Amount.	Aggregate.
June 18, 1878 .....	\$40,000.00	\$40,000.00	September 30, 1890 .....	\$20,000.00	\$267,500.00
March 3, 1879 .....	45,000.00	85,000.00	July 13, 1892 .....	15,000.00	282,500.00
June 14, 1880 .....	45,000.00	130,000.00	August 18, 1894 .....	7,000.00	289,500.00
March 3, 1881 .....	30,000.00	160,000.00	June 3, 1896 .....	7,000.00	296,500.00
August 2, 1882 .....	30,000.00	190,000.00	March 3, 1899 .....	10,000.00	306,500.00
July 5, 1884 .....	20,000.00	210,000.00	June 13, 1902 .....	\$13,500.00	\$320,000.00
August 5, 1886 .....	22,500.00	232,500.00	Sales .....	48.90	\$320,048.90
August 11, 1888 .....	15,000.00	247,500.00			

\* Allotted from appropriation of \$20,000 for Neuse and Trent rivers, North Carolina.

## COMMERCIAL STATISTICS FOR YEAR ENDING DECEMBER 31, 1902.

Class of goods.	Quantity.	Class of goods.	Quantity.
	<i>Tons.</i>		<i>Tons.</i>
Cotton .....	5,535	Oysters .....	2,000
Cotton seed .....	3,182	Clams .....	3,000
Cotton-seed oil .....	74	Rosin .....	4,071
Cotton-seed meal .....	1,090	Turpentine, crude .....	2,000
Tobacco, leaf .....	2,525	Turpentine, spirits .....	2,000
Rice, rough .....	72	Wood .....	2,025
Grains .....	10,862	Timber .....	141,738
Hay .....	1,731	Lumber .....	217,037
Potatoes .....	4,362	Shingles .....	422
Vegetables .....	3,226	Fertilizers .....	19,620
Cattle .....	5	Machinery .....	1,010
Horses .....	100	General merchandise .....	25,874
Hogs .....	11	Coal and minerals .....	1,596
Poultry .....	5		
Eggs .....	95	Total .....	456,994
Fish .....	1,722		

Gain over last year, 183,446 tons. Transportation lines established during the year, 1. Number of passengers, 18,117.

*Statement of vessels navigating the Neuse River, North Carolina, during the calendar year ending December 30, 1902.*

Class of vessel.	Number.	Aggregate net tonnage.	Draft.
			<i>Fect.</i>
Steamers .....	28	2,143	2 to 8
Schooners, sloops, etc .....	138	6,566	2 to 8
Barges .....	36	9,900	6 to 8

## (b) TRENT RIVER.

*References.*—Annual reports, 1879, page 711 (also H. Doc. No. 68, 45th Cong., 3d sess.); 1900, pages 263 and 1802, and 1901, page 1545 (also H. Doc. No. 121, 56th Cong., 2d sess.).

The work of the past year was exclusively maintenance, confined to that portion of the stream between the junction with the Neuse River (at Newbern) and Trenton, a distance of 38½ miles, from which 19 large snags, 1 stump, 142 logs, 10 trees, and three-fourths cord small snags were removed from the channel, and 17 trees were felled and hauled back from the banks.

With the available balance it is proposed to maintain the channel between Newbern and Trenton, and to do as much as possible of the dredging at Newbern in accordance with the report on examination and survey published in the annual report for 1901, page 1545, and also in House Executive Document No. 121, Fifty-sixth Congress, second session.

Additional appropriations are recommended of \$19,000 for completing the dredging project, and for \$2,500 for annual maintenance of channel to Trenton.

# 1100 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

## Money statement.

July 1, 1902, balance unexpended .....	\$6,568.33
Received from sales during fiscal year .....	48.90
	<hr/>
June 30, 1903, amount expended during fiscal year .....	6,617.23
	1,279.28
	<hr/>
July 1, 1903, balance unexpended .....	5,337.95
	<hr/>
July 1, 1903, balance available .....	5,337.95
	<hr/>
(Amount (estimated) required for completion of existing project .....	19,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903:	
For works of improvement.....	\$19,000.00
For maintenance of improvement .....	2,500.00
	<hr/>
	21,500.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and section 7 of the river and harbor act of 1899.	

## APPROPRIATED.

Date.	Amount.	Aggregate.	Date.	Amount.	Aggregate.
March 3, 1879 .....	\$7,000.00	\$7,000.00	September 19, 1890 .....	\$5,000.00	\$55,500.00
June 14, 1890 .....	10,000.00	17,000.00	July 13, 1892 .....	5,000.00	60,500.00
March 3, 1881 .....	5,000.00	22,000.00	August 18, 1894 .....	4,000.00	64,500.00
August 2, 1882 .....	10,000.00	32,000.00	June 3, 1895 .....	2,000.00	66,500.00
July 5, 1884 .....	10,000.00	42,000.00	March 3, 1899 .....	2,500.00	69,000.00
August 5, 1886 .....	3,500.00	45,500.00	June 13, 1902 .....	6,500.00	75,500.00
August 11, 1888 .....	5,000.00	50,500.00	Sales .....	48.90	75,548.90

<sup>a</sup>Allotted from \$20,000 appropriated for Neuse and Trent rivers, North Carolina.

## COMMERCIAL STATISTICS FOR THE YEAR ENDING DECEMBER 31, 1902.

Class of goods.	Tons.	Class of goods.	Tons.
Cotton .....	6,055	Clams .....	2,000
Cotton seed .....	850	Rosin .....	4,000
Cotton-seed meal .....	740	Turpentine, crude .....	2,000
Tobacco, leaf .....	2,504	Turpentine, spirits .....	2,000
Rice, rough .....	9	Wood .....	1,330
Grains .....	7,677	Timber .....	48,375
Hay .....	1,589	Lumber .....	75,100
Potatoes .....	1,736	Shingles .....	1,063
Vegetables .....	2,001	Fertilizers .....	10,830
Cattle .....	90	Machinery .....	1,075
Horses .....	103	General merchandise .....	25,063
Hogs .....	22	Coal and minerals .....	1,085
Poultry .....	5	Peanuts .....	7
Eggs .....	27		
Fish .....	1,344		
Oysters .....	2,004		
		Total .....	201,704

Gain over last year, 34,716.5 tons. Number of passengers, 16,447.

## Statement of vessels navigating the Trent River, North Carolina, during the calendar year ending December 31, 1902.

Class of vessel.	Number.	Aggregate net tonnage.	Draft.
Stoamers .....	14	1,411	<i>Feet.</i> 2 to 8
Schooners, sloops, etc .....	38	364	2 to 7
Barges .....	20	5,500	6 to 8

## N 7.

## IMPROVEMENT OF WATERWAY BETWEEN NEWBERN AND BEAUFORT, NORTH CAROLINA.

*References.*—Annual Reports, 1884, page 1065; 1890, page 1130; 1896, page 1115.

No work of improvement was done during the year.

The work on this waterway has been suspended for several years pending the cession or sale to the Government of the private canal included therein.

The survey of June, 1901, indicated a number of shoals and the necessity for considerable work, in order to obtain project depth and width, which work would be useless unless the canal company made a corresponding increase in the canal itself.

No present application of available balance is contemplated, and no additional appropriation is at present recommended.

*Money statement.*

July 1, 1902, balance unexpended .....	\$6, 303. 67
June 30, 1903, amount expended during fiscal year .....	3. 67
July 1, 1903, balance unexpended .....	6, 300. 00
Amount (estimated) required for completion of existing project .....	57, 000. 00

## APPROPRIATED.

Date.	Amount.	Aggregate.
August 2, 1882.....	\$10, 000	\$10, 000
August 5, 1886.....	10, 000	20, 000
August 11, 1888.....	15, 000	35, 000

## COMMERCIAL STATISTICS FOR THE YEAR ENDING DECEMBER 31, 1902.

Class of goods.	Quantity.
	<i>Tons.</i>
Timber .....	31, 500
Lumber .....	28, 000
Fertilizers .....	714
General merchandise .....	6, 700
Total .....	66, 974

Gain over 1900 of 31,195 tons.

*Statement of vessels navigating the inland waterway between Newbern and Beaufort, N. C., during the calendar year ending December 31, 1902.*

Class of vessel.	Number.	Aggregate net tonnage.	Draft.
			<i>Fect.</i>
Steamers .....	5	177	3 to 7
Schooners, sloops, etc .....	33	396	2 to 4



## N 8.

## IMPROVEMENT OF HARBOR AT BEAUFORT, NORTH CAROLINA.

*References.*—Annual Reports, 1896, page 1115; 1900, pages 271 and 1806.

The work of the past year has been as follows:

At Fort Macon, 196 linear feet of sand fences were built new, 10,788 feet were built higher, 1,793 feet were repaired, and 12,708 feet were filled under.

At Shackleford Point, 576 feet were built new, 8,104 feet were built higher, 240 feet repaired, and 5,378 feet filled under.

Bermuda grass was planted at both places to hold the sand accumulated by the fences and to prevent its drifting away.

It is proposed to apply the available balance to maintaining the sand fences at Fort Macon and Shackleford Point, and to restoring the project depth across Bulkhead shoal.

An additional appropriation of \$3,000 annually is recommended for the maintenance of this improvement.

*Money statement.*

July 1, 1902, balance unexpended .....	\$3,025. 28
Received from sales during fiscal year .....	350. 00
	<hr/> 3,375. 28
June 30, 1903, amount expended during fiscal year .....	1,150. 69
	<hr/> 2,224. 57
July 1, 1903, balance unexpended .....	2,224. 57
July 1, 1903, outstanding liabilities .....	94. 60
	<hr/> 2,129. 97
	<hr/> <hr/>
{ Amount that can be profitably expended in fiscal year ending June 30, 1905, for maintenance of improvement, in addition to the balance unexpended July 1, 1903.....	3,000. 00
{ Submitted in compliance with requirements of sundry civil act of June 4, 1897, and section 7 of the river and harbor act of 1899.	

## APPROPRIATED.

Date.	Amount.	Aggregate.	Date.	Amount.	Aggregate.
July 4, 1886 .....	\$5,000	\$5,000	August 11, 1888 .....	\$35,000	\$125,000
March 3, 1880 .....	30,000	30,000	September 19, 1890 .....	15,000	140,000
August 2, 1882 .....	25,000	55,000	July 13, 1892 .....	10,000	150,000
July 5, 1884 .....	20,000	75,000	June 3, 1896 .....	5,000	155,000
August 5, 1886 .....	15,000	90,000	June 13, 1902 .....	3,000	158,000
			Sales .....	350	158,350

## COMMERCIAL STATISTICS FOR THE YEAR ENDING DECEMBER 31, 1902.

Class of goods.	Quantity.	Class of goods.	Quantity.
	<i>Tons.</i>		<i>Tons.</i>
Cotton .....	508	Timber .....	750
Grains .....	4	Lumber .....	1,541
Hay .....	60	Fertilizers .....	1,186
Poultry .....	1	General merchandise .....	26,970
Eggs .....	1	Coal and minerals .....	90
Fish .....	14,972	Fish oil .....	1,255
Oysters .....	17,000	Canned oysters .....	1,125
Clams .....	6,520		
Wood .....	7,000	Total .....	78,983

Gain over last year, 6,800 tons. Transportation lines established during the year, 1.  
Number of passengers, 12,000.

*Statement of vessels navigating the harbor at Beaufort, N. C., for the calendar year ending December 31, 1903.*

Class of vessels.	Number.	Aggregate net tonnage.	Draft.
Steamers .....	16	686	2.5 to 7
Schooners, sloops, etc. ....	308	3,184	2 to 7
Naphtha launches .....	23	205	2 to 4.6
Yachts .....	40	1,200	3 to 7

## N 9.

## IMPROVEMENT OF WATERWAY BETWEEN BEAUFORT HARBOR AND NEW RIVER, NORTH CAROLINA.

*References.*—Annual Reports, 1885, page 1133 (S. Doc. No. 35, 44th Cong., 1st sess.); 1891, page 1378; 1892, page 1141; 1893, page 1379; 1894, page 1034; 1896, page 1117; 1897, page 1398.

No work of improvement was done during the year. The expenditures covered the cost of collecting commercial statistics and construction of dredging plant.

It is proposed to apply the available balance to the completion of the Bogue Sound channel to project depth and width.

After completion of this project additional appropriations of about \$2,000 annually will be needed to maintain the channel.

*Money statement.*

July 1, 1902, balance unexpended .....	\$10,449.64
June 30, 1893, amount expended during fiscal year .....	119.96
July 1, 1903, balance unexpended .....	10,329.68

{ Amount that can be profitably expended in fiscal year ending June 30, 1905, for maintenance of improvement in addition to the balance unexpended July 1, 1903 .....	2,000.00
{ Submitted in compliance with requirements of sundry civil act of June 4, 1897, and section 7 of the river and harbor act of 1899.	

## APPROPRIATED.

Date.	Amount.	Aggregate.	Date.	Amount.	Aggregate.
August 5, 1886 .....	\$10,000	\$10,000	August 18, 1894 .....	\$2,500	\$42,500
August 11, 1888 .....	5,000	15,000	June 3, 1896 .....	1,000	43,500
September 19, 1890 .....	15,000	30,000	June 13, 1902 .....	9,500	53,000
July 13, 1892 .....	10,000	40,000			

## COMMERCIAL STATISTICS FOR THE YEAR ENDING DECEMBER 31, 1902.

Class of goods.	Quantity.	Class of goods.	Quantity.
	Tons.		Tons.
Cotton .....	100	Clams .....	2,000
Cotton seed .....	200	Turpentine, crude .....	10
Grains .....	225	Turpentine, spirits .....	75
Potatoes .....	115	Wood .....	700
Vegetables .....	10	Timber .....	1,125
Hogs .....	10	Lumber .....	300
Poultry .....	2	Fertilisers .....	225
Eggs .....	1	General merchandise .....	7,710
Fish .....	4,200		
Oysters .....	1,600	Total .....	18,608

Loss over last year, 15,309.2 tons.

# 1104 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

*Statement of vessels navigating the inland waterway between Beaufort Harbor and New River, North Carolina, during the calendar year ending December 31, 1902.*

Class of vessel.	Number.	Aggregate net tonnage.	Draft.
Steamers .....	1	21	<i>Fed.</i> 3
Schooners, sloops, etc .....	37	370	2 to 4

## N 10.

### IMPROVEMENT OF NEW RIVER, NORTH CAROLINA.

*References.*—Annual Reports, 1882, page 1117; 1886, page 992; 1891, page 1380; 1899, page 1501.

Work of the year has been only the examination and survey ordered by river and harbor act of June 13, 1902, report of which was made to the office of the Chief of Engineers under date of June 11, 1903.

It is proposed to withhold the available balance from expenditure pending action on the report of the above-mentioned examination and survey. No further appropriation is asked for.

### *Money statement.*

July 1, 1902, balance unexpended .....	\$3,371.26
Received from sales during fiscal year .....	.10
	3,371.36
June 30, 1903, amount expended during fiscal year .....	138.07
July 1, 1903, balance unexpended .....	3,233.29

### APPROPRIATED.

Date.	Amount.	Aggregate.	Date.	Amount.	Aggregate.
July 4, 1886, to July 7, 1888 .....		\$50,000.00	August 11, 1888 .....	\$3,000.00	\$23,000.00
August 2, 1882 .....	\$5,000.00	5,000.00	September 19, 1890 .....	5,000.00	28,000.00
July 4, 1884 .....	5,000.00	10,000.00	July 13, 1892 .....	5,000.00	33,000.00
August 5, 1886 .....	10,000.00	20,000.00	Sales .....	.10	33,000.10

### COMMERCIAL STATISTICS FOR THE YEAR ENDING DECEMBER 31, 1902.

Class of goods.	Quantity.	Class of goods.	Quantity.
	<i>Tons.</i>		<i>Tons.</i>
Cotton .....	90	Timber .....	844
Cotton seed .....	175	Lumber .....	600
Fish .....	1,000	Fertilizers .....	304
Oysters .....	600	Machinery .....	5
Clams .....	125	General merchandise .....	665
Rosin .....	371	Peanuts .....	17
Turpentine, crude .....	125		
Turpentine, spirits .....	150	Total .....	5,211
Wood .....	140		

Gain over last year, 1,654.55 tons. Number of passengers, 75.

*Statement of vessels navigating New River, North Carolina, during the calendar year ending December 31, 1902.*

Class of vessels.	Number.	Aggregate net tonnage.	Draft.
Schooners .....	3	40	<i>Feet.</i> 2.5 to 5

## N II.

### IMPROVEMENT OF NORTH EAST AND BLACK RIVERS, AND CAPE FEAR RIVER, ABOVE WILMINGTON, NORTH CAROLINA.

#### (a) NORTH EAST RIVER.

*References.*—Annual Reports, 1885, page 1123; 1890, page 1181; 1895, page 1389; and 1896, page 1122 (also H. Ex. Docs. No. 35, 51st Cong., 1st sess., and No. 322, 53d Cong., 3d sess.).

The work of the year has been the removal of 230 large snags and 81 stumps from the channel, and 1,084 trees felled and hauled back from the banks between the seventy-first and eighty-eighth mile-posts.

With the available balance it is proposed to maintain the natural channel up to Hallsville.

Additional appropriations of \$3,000 annually are recommended for the maintenance of the natural channel.

#### (b) BLACK RIVER.

*References.*—For history see Annual Report for 1896, page 1125; for reports on examinations, see Annual Report for 1884, page 1061; and 1885, page 1145.

The work of the year has been the removal of 1,190 large snags and 18 logs from the channel, and 995 trees felled and hauled back from the banks between the mouth of the river and Clear Run.

With the available balance it is proposed to maintain the natural channel as far up as Clear Run.

Additional appropriations of \$3,000 annually are recommended for the maintenance of this stream.

#### (c) CAPE FEAR RIVER, ABOVE WILMINGTON.

*References.*—Annual Reports for 1872, page 742; 1881, page 1018; and 1901, page 1559 (also H. Doc. No. 180, 56th Cong., 2d sess.).

The work of the year has been the removal of 1,313 large snags, 7 stumps, and 3 logs from the channel between Fayetteville and the mouth of Black River.

With the available balance it is proposed to maintain the natural channel up to Fayetteville, to do the preliminary work necessary for determining lock and dam sites under the canalization project for obtaining 8 feet depth to Fayetteville, and to purchase sites for locks and dams when locations are determined.

# 1106 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY

Additional appropriations are recommended of \$8,000 annually for the maintenance of the present channel to Fayetteville, and of \$400,000 for the construction of the first lock and dam. It is not believed advisable to begin the construction of a lock and dam until funds are available for its completion under one contract.

## Money statement.

### BLACK RIVER.

July 1, 1902, balance unexpended .....	\$2, 289. 27
June 30, 1903, amount expended during fiscal year .....	1, 336. 31
July 1, 1903, balance unexpended .....	952. 96
<div> <div> Amount that can be profitably expended in fiscal year ending June 30, 1905, for maintenance of improvement, in addition to the balance unexpended July 1, 1903..... </div> <div> Submitted in compliance with requirements of sundry civil act of June 4, 1897, and section 7 of the river and harbor act of 1899. </div> </div>	
	3, 000. 00

## Appropriated.

Date.	Amount.	Aggregate.	Date.	Amount.	Aggregate.
August 5, 1886 .....	\$3, 000. 00	\$3, 000. 00	March 3, 1899 .....	\$2, 000. 00	\$18, 000. 00
July 13, 1892 .....	10, 000. 00	13, 000. 00	June 13, 1902 .....	2, 000. 00	20, 000. 00
August 17, 1894 .....	2, 000. 00	15, 000. 00	Other receipts: Sales, etc. ....		243. 34
June 3, 1896 .....	1, 000. 00	16, 000. 00			

<sup>a</sup> Allotted from joint appropriation of \$10,000 for North East and Black rivers, North Carolina, and Cape Fear River, North Carolina, above Wilmington.

## COMMERCIAL STATISTICS FOR THE YEAR ENDING DECEMBER 31, 1902.

Class of goods.	Quantity.	Class of goods.	Quantity.
	<i>Tons.</i>		<i>Tons.</i>
Cotton .....	205	Tar .....	1, 960
Cotton seed .....	75	Wood .....	7, 000
Cotton-seed meal .....	18	Timber .....	35, 609
Grains .....	65	Lumber .....	200
Hay and straw .....	80	Shingles .....	1, 563
Potatoes .....	41	Poles, telegraph .....	2, 000
Cattle .....	90	Cross ties .....	2, 000
Horses .....	4	General merchandise .....	14, 500
Hogs .....	24	Machinery .....	5
Poultry .....	27	Peanuts .....	23
Eggs .....	22	Dog tongue .....	13
Fertilizer .....	920	Fish .....	2
Rosin .....	4, 800	Fruit and vegetables .....	3
Turpentine—			
Crude .....	300	Total .....	72, 224
Spirits .....	675		

Increase since last year 11,155 tons.

Number of passengers 750.

All of the above passed over 12 miles of Cape Fear River, North Carolina, above Wilmington, but is not included in the report for that river.

*Statement of vessels navigating Black River, North Carolina, during the calendar year ending December 31, 1902.*

Class of vessel.	Number.	Aggregate net tonnage.	Draft.
Steamers .....	3	78	<i>Feet.</i> 8 to 3.5
Steam tugs .....	5	49	3.5 to 4.5
Flats (about) .....	40	3,000	1.5 to 4.5

*Money statement.*

NORTH EAST RIVER.

July 1, 1902, balance unexpended .....	\$2,004. 68
June 30, 1903, amount expended during fiscal year .....	1,055. 73
July 1, 1903, balance unexpended .....	948. 95
Amount that can be profitably expended in fiscal year ending June 30, 1905, for maintenance of improvement in addition to the balance unexpended July 1, 1903.....	
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and section 7 of the river and harbor act of 1899.	
	3,000. 00

APPROPRIATED.

September 19, 1890, for North East (Cape Fear) River, North Carolina ..	\$5,000. 00
July 13, 1892, for North East (Cape Fear) River, North Carolina .....	5,000. 00
August 18, 1894, for North East (Cape Fear) River, North Carolina .....	5,000. 00
March 3, 1899, for North East River, North Carolina .....	2,000. 00
June 13, 1902, for North East River, North Carolina .....	<sup>a</sup> 2,000. 00
Other receipts, March 4, 1897, sales to Cape Fear River .....	243. 33
Total .....	19,243. 33

COMMERCIAL STATISTICS FOR THE YEAR ENDING DECEMBER 31, 1902.

Class of goods.	Quantity.	Class of goods.	Quantity.
	<i>Tons.</i>		<i>Tons.</i>
Cotton .....	410	Turpentine, crude .....	188
Cotton seed .....	325	Turpentine, spirits .....	298
Cotton-seed meal .....	100	Tar .....	840
Cotton-seed oil .....	3	Wood .....	7,000
Rice, rough .....	10	Timber .....	62,027
Grain .....	150	Lumber .....	30
Hay and rice straw .....	42	Shingles and shingle blocks .....	750
Potatoes .....	69	Poles and piles .....	1,400
Peanuts .....	15	Cross-ties .....	4,000
Fruit and vegetables .....	4	Brick .....	3,000
Cattle .....	25	Fertilizer .....	13,826
Hogs .....	30	General merchandise .....	4,000
Eggs .....	8	Lime .....	20
Poultry .....	19		
Fish .....	2	Total .....	100,186
Rosin .....	1,600		

Increase since last year, 33,313 tons, which is due to the increase in timber receipts.  
Number of passengers, 230.

<sup>a</sup> Allotted from joint appropriation of \$10,000 for North East and Black rivers, North Carolina, and Cape Fear River, North Carolina, above Wilmington.

# 1108 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

*Statement of vessels navigating North East River, North Carolina, during the calendar year ending December 31, 1902.*

Class of vessels.	Number.	Aggregate net tonnage.	Draft.
Steamers .....	1	31	<i>Feet.</i> 3.5
Steam tugs .....	10	172	2.5 to 7.5
Flats (about) .....	45	3,375	1.5 to 4.

## *Money statement.*

### CAPE FEAR RIVER ABOVE WILMINGTON.

July 1, 1902, balance unexpended .....	\$56,046. 70
June 30, 1903, amount expended during fiscal year .....	3,453. 31
July 1, 1903, balance unexpended .....	52,593. 39
Amount (estimated) required for completion of existing project.....	1,300,000. 00
Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903:	
For works of improvement.....	\$400,000. 00
For maintenance of improvement .....	8,000. 00
	408,000. 00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and section 7 of the river and harbor act of 1899.	

### APPROPRIATIONS.

Date.	Amount.	Aggregate.	Date.	Amount.	Aggregate.
March 3, 1881.....	\$30,000. 00	\$30,000. 00	August 18, 1894.....	\$14,000. 00	\$132,250. 00
August 2, 1882.....	30,000. 00	60,000. 00	June 3, 1896.....	5,000. 00	137,250. 00
July 6, 1884.....	5,000. 00	65,000. 00	March 3, 1899.....	5,000. 00	142,250. 00
August 5, 1886.....	11,250. 00	76,250. 00	June 13, 1902 <sup>a</sup> .....	56,000. 00	198,250. 00
August 11, 1888.....	12,000. 00	88,250. 00	Other receipts, sales to		
September 19, 1890.....	15,000. 00	103,250. 00	other appropriations		
July 13, 1892.....	15,000. 00	118,250. 00	during 1897.....		414. 33

<sup>a</sup> Six thousand dollars allotted from joint appropriation of \$10,000 for North East and Black rivers, North Carolina, and Cape Fear River, North Carolina, above Wilmington.

### COMMERCIAL STATISTICS FOR THE YEAR ENDING DECEMBER 31, 1902.

Class of goods.	Quantity.	Class of goods.	Quantity.
	<i>Tons.</i>		<i>Tons.</i>
Cotton .....	1,774	Tar .....	2,855
Cotton seed .....	360	Wood .....	10,000
Cotton-seed meal .....	360	Timber .....	52,044
Cotton-seed oil .....	67	Lumber .....	220
Grains .....	150	Shingles .....	1,244
Rice .....	95	Fertilizers .....	28,964
Straw .....	110	Machinery .....	57
Hay .....	63	General merchandise .....	32,996
Potatoes .....	39	Coal .....	897
Cattle .....	300	Brick .....	3,750
Horses .....	55	Peanuts .....	5
Hogs .....	30	Fish .....	3
Poultry .....	118	Fruit and vegetables .....	20
Eggs .....	75	Cross-ties .....	22,000
Roam .....	3,066	Poles and piles .....	5,000
Turpentine:			
Crude .....	330	Total .....	167,584
Spirits .....	425		

Increase since last year, 43,422 tons, which is due to increased receipts of timber, cross-ties, and telegraph poles.

Number of passengers, 3,580.

All of Black River commerce passes over 12 miles of this river, but is not included in the above.

*Statement of vessels navigating Cape Fear River, North Carolina, above Wilmington, during the year ending December 31, 1902.*

Class of vessel.	Number.	Aggregate net tonnage.	Draft.
Steamers .....	6	439	<i>Feet.</i> 3 to 4
Steam tugs .....	7	177	3.5 to 7
Flats (about) .....	40	3,000	1.5 to 4.5

## N 12.

### IMPROVEMENT OF CAPE FEAR RIVER, NORTH CAROLINA, AT AND BELOW WILMINGTON.

*References.*—For special descriptions see Annual Reports of the Chief of Engineers for 1873, page 44; 1887, page 1047; 1895, page 1335; 1896, page 1131; and 1901, page 1552 (also H. Doc. No. 180, 56th Cong., 2d sess.).

The operations for the year have been the work of the suction dredge *Cape Fear* on the ocean bar and river channels and the clam-shell dredge *Ajax* on the river channels and on the Old Woodbury jetty, removing obstructions at the mouth of the Brunswick River, building three deck lighters, making minor surveys, and repairing and caring for plant. The deck lighters were built under contract. All other work was done by hired labor and United States plant.

The suction dredge *Cape Fear*, when available for work on Cape Fear River, was employed on the ocean bar channel when weather permitted, and at other times on the river channel. The amount of work done by this dredge during the year and location of the same is as follows:

	Cubic yards.
Ocean Bar channel .....	225,669
River channels .....	104,010
Total .....	329,679

Total cost of operating, superintendence, and contingencies, \$24,166.88.

Cost per cubic yard, 7.3 cents.

The clam-shell dredge *Ajax* removed from the river channel 428,226 cubic yards of material and 50 stumps and logs, and from the Old Woodbury jetty 1,607 tons of large stone. Cost of same, 8 cents per cubic yard for dredging; and for jetty removed, \$6,881.02, including cost of preparing dredge for this special work.

The stone removed from Old Woodbury jetty was used in making repairs to the dams, 1,275 tons being placed on New Inlet dam and 334 tons on Swash Defence dam.

The snag boat *Wright* removed the obstructions at mouth of the Brunswick River as follows: Three hundred and six piles, 139 large snags, and drove 6 piles for ranges, at a total cost of \$519.50.



# 1110 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

With the available balance it is proposed: (1) To complete the removal of Old Woodbury jetty, etc.; (2) to dredge the river channel where shoaling has occurred; (3) to repair the Swash Defense and New Inlet dams and Snows Marsh dike; and, (4) if funds permit, to construct mooring dolphins at Wilmington. Should any balance remain it will be applied to the work of continuing the improvement under the project of October 6, 1890, to obtain 20 feet depth and 270 feet width from Wilmington to the ocean, about 60 per cent of which has been done.

Additional appropriations are recommended of \$250,000 for continuing the improvement and of \$50,000 annually for maintenance.

## Money statement.

July 1, 1902, balance unexpended .....	\$162, 137. 31
Received from sales during fiscal year .....	277. 40
	<hr/> 162, 414. 71
June 30, 1903, amount expended during fiscal year .....	68, 332. 60
	<hr/> 94,082. 11
July 1, 1903, balance unexpended .....	94,082. 11
July 1, 1903, outstanding liabilities .....	8, 148. 98
	<hr/> 85, 933. 13
July 1, 1903, balance available .....	85, 933. 13
July 1, 1903, amount covered by uncompleted contracts .....	2, 150. 00
	<hr/> 885,000. 00
Amount (estimated) required for completion of existing project .....	
Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903:	
For works of improvement .....	\$250,000. 00
For maintenance of improvement .....	50,000. 00
	<hr/> 300,000. 00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and section 7 of the river and harbor act of 1899.	

## APPROPRIATED.

Date.	Amount.	Aggregate.	Date.	Amount.	Aggregate.
March 2, 1829, to July 22, 1854.....		a \$363, 228. 92	August 2, 1882.....	\$225,000	\$1, 502, 500. 00
July 11, 1870.....	\$100,000	100,000. 00	July 5, 1884.....	200,000	1, 702, 500. 00
March 3, 1871.....	75,000	175,000. 00	August 5, 1886.....	157,500	1, 860, 000. 00
June 10, 1872.....	100,000	275,000. 00	August 11, 1888.....	245,000	2, 105, 000. 00
March 3, 1873.....	100,000	375,000. 00	September 19, 1890.....	170,000	2, 275, 000. 00
June 23, 1874.....	150,000	525,000. 00	July 13, 1892.....	200,000	2, 475, 000. 00
March 3, 1875.....	150,000	675,000. 00	August 18, 1894.....	200,000	2, 675, 000. 00
August 14, 1876.....	132,500	807,500. 00	June 3, 1896.....	195,000	2, 870, 000. 00
June 18, 1878.....	160,000	967,500. 00	March 3, 1899.....	150,000	3, 020, 000. 00
March 3, 1879.....	100,000	1,067,500. 00	June 13, 1902.....	150,000	3, 170, 000. 00
June 14, 1880.....	70,000	1,137,500. 00	Other receipts: Sales and rents to other appropriations .....		
March 3, 1881.....	140,000	1,277,500. 00			18, 868. 93

a Balance of \$3,728.07 turned over to surplus fund.

## COMMERCIAL STATISTICS FOR YEAR ENDING DECEMBER 31, 1902.

### Exports, foreign and coastwise.

[Furnished by Col. J. L. Cantwell, secretary of Wilmington Produce Exchange.]

	Tons.
Cotton.....	85, 420
Manufactured cotton and yarn goods.....	1, 388
Lumber.....	106, 258
Shingles.....	925

	Tons.
Rosin.....	15,092
Tar.....	5,795
Turpentine:	
Spirits.....	4,025
Crude.....	605
Pitch.....	253
Peanuts.....	415
Paper stock.....	10
Miscellaneous.....	65,000
<b>Total.....</b>	<b>285,186</b>

*Exports, internal.*

[Furnished by steamboat, flat, and raft men.]

	Tons.
Miscellaneous.....	99,195

Total of exports (foreign, coastwise, and internal), 384,381 tons.

*Imports, foreign and coastwise.*

[Furnished by importers and manufacturers.]

	Tons.
Fertilizers and fertilizer material.....	65,259
Coal.....	15,243
Salt.....	3,912
Oil (6½ pounds to gallon).....	11,415
Cement.....	5,288
Grain, corn, and rice.....	1,800
Miscellaneous (naval stores, cotton, and general merchandise).....	100,000
<b>Total.....</b>	<b>202,917</b>

*Imports, internal.*

[Furnished by steamboat, flat, and raft men.]

	Tons.
Cotton.....	2,414
Tar.....	6,035
Turpentine:	
Spirits.....	1,688
Crude.....	970
Rosin.....	10,416
Lumber and timber.....	152,560
Shingles.....	3,581
Wood.....	27,500
Brick.....	6,750
Cross-ties.....	29,875
Telegraph poles.....	9,280
Miscellaneous.....	3,264
<b>Total.....</b>	<b>254,383</b>

Total imports (foreign, coastwise, and internal), 457,250 tons.

*Summary.*

	Tons.
Exports:	
Foreign and coastwise.....	285,186
Internal.....	99,195
Imports:	
Foreign and coastwise.....	202,917
Internal.....	254,333
<b>Total commerce.....</b>	<b>841,631</b>

Increase since last year, 114,272 tons.

# 1112 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

## Foreign commerce for the year 1902.

[Furnished by the collector of customs of the port of Wilmington, N. C.]

Class of goods.	Quantity.	Value.
<b>EXPORTS.</b>		
Cotton.....bales	335,730	\$14,517,496
Rosin.....barrels	106,130	127,553
Tar.....do	4,344	7,658
Pitch.....do	450	623
Spirits turpentine.....gallons	41,963	18,002
Lumber.....M feet	7,197	106,046
Shingles.....M	1,762	10,448
Miscellaneous.....tons		36,873
Total.....		14,824,696
<b>IMPORTS.</b>		
Kainit.....tons	11,523	54,653
Potash (M. and S. of).....do	2,140	73,393
Brimstone, pyrites.....do	15,716	53,386
Miscellaneous.....do		108,807
Total.....		290,239

*Cotton steamers loaded at the port of Wilmington, N. C., during the calendar year ending December 31, 1902.*

[Furnished by Messrs. Alexander Sprunt & Son.]

Name of steamer.	Registered tonnage.	Draft, loaded.	Bales.	Name of steamer.	Registered tonnage.	Draft, loaded.	Bales.
		<i>Fet.</i>				<i>Fet.</i>	
Gymeric.....	2,598	19	14,259	Gladys.....	1,529	17.5	7,010
Polana.....	1,898	18	9,679	Baron Eldon.....	2,365	18	12,931
Wingrove.....	1,818	18.5	10,796	Europa.....	652	14.5	3,242
Morcia.....	1,693	17.5	9,217	Aercia.....	1,847	19	11,292
Chatburn.....	1,225	16	6,402	Valetta.....	1,987	17.5	10,437
Tolosa.....	2,099	18	10,963	Devonshire.....	2,363	18.5	11,918
Whitehall.....	1,314	15	6,774	Osborne.....	2,796	19.5	14,607
Tuskar.....	1,969	18	9,741	Holmlea.....	1,142	16	5,416
Polana.....	1,898	18.5	9,135	Candlehoe.....	2,466	18.5	13,523
Sir Richard Green-ville.....	1,745	18.5	8,650	Wandby.....	2,580	19	14,236
Rosewood.....	1,103	17	5,562	Lamrest.....	2,415	18.5	13,900
Tolosa.....	2,099	17.5	10,426	Mountby.....	2,113	17.5	11,261
Vauxhall Bridge.....	2,178	18.5	11,800	Hermiston.....	2,839	20	16,165
Gladestry.....	1,521	18	7,673	Europa.....	652	14.5	3,214
Haxby.....	2,252	19.5	11,353	Harbart.....	2,149	19	11,906
Vera.....	1,854	17.5	9,042	Riverton.....	2,235	21	10,839
Hasungden.....	1,220	16	6,058	Total.....	62,584		329,427

*Statement of foreign and coastwise vessels of 100 tons and over at the port of Wilmington N. C., for the calendar year ending December 31, 1902.*

[Furnished by Capt. Edgar Williams, harbor master.]

Class of vessel.	American.		Foreign.		Total.	
	Number.	Tonnage.	Number.	Tonnage.	Number.	Tonnage.
Steamers.....	114	139,795	50	85,503	164	225,298
Barks.....	2	1,154	18	10,928	20	12,028
Brigs.....	1	294	1	196	2	490
Barges.....	11	19,575			11	19,575
Schooners.....	126	51,720	17	3,932	143	55,652
Total.....	254	212,538	86	100,559	340	313,097

The above does not include vessels which took cargoes to Southport; vessels coming to Southport in distress, for supplies or for a harbor, the total estimated tonnage of which is 15,000; or vessels and barges taking cargoes to Fort Caswell, the total estimated tonnage of which is 25,000.

APPENDIX N—REPORT OF CAPTAIN WINSLOW. 1113

Vessels owned by the United States Government are not included. No record is made of steamboats plying on the rivers above Wilmington, or of small vessels and steam tugs of less than 100 tons.

*Statement of vessels plying the Cape Fear River, North Carolina, at and below Wilmington, during the calendar year ending December 31, 1902.*

[This statement is in addition to that furnished by Captain Williams.]

Class of vessel.	Number.	Aggregate net tonnage.	Draft.
Steamers .....	18	6,020	<i>Fect.</i> 2 to 17
Steam tugs .....	18	309	2 to 10

N 13.

IMPROVEMENT OF TOWN CREEK, BRUNSWICK COUNTY, NORTH CAROLINA.

*References.*—Annual Reports, 1881, page 1024 (also H. Doc. No. 78, 46th Cong., 3d sess.); 1897, page 1434 (also H. Doc. No. 214, 54th Cong., 2d sess.); 1900, page 1927.

The work of the year has been exclusively maintenance. In the month of March the small balance then available was expended in the removal of 61 obstructing snags.

There is no available balance for the improvement, and, owing to the small commercial importance, no estimate for further appropriations is submitted.

*Money statement.*

July 1, 1902, balance unexpended .....	\$97.55
June 30, 1903, amount expended during fiscal year .....	97.55

APPROPRIATIONS.

March 3, 1881 .....	\$1,000
March 3, 1899 .....	8,500
<b>Total</b> .....	<b>9,500</b>

COMMERCIAL STATISTICS FOR THE YEAR ENDING DECEMBER 31, 1902.

Class of goods.	Quantity.	Class of goods.	Quantity.
	<i>Tons.</i>		<i>Tons.</i>
Cotton .....	25	Lumber .....	1,350
Cotton seed .....	20	Shingles .....	24
Cotton-seed meal .....	32	Fertilizers .....	100
Rice .....	325	Machinery .....	42
Rice straw .....	400	General merchandise .....	1,220
Hay .....	8	Watermelons .....	22
Potatoes .....	90	Peanuts .....	130
Hogs .....	6	Grain .....	75
Poultry .....	6	Tar .....	380
Eggs .....	5	Fruit and vegetables .....	4
Rosin .....	960	Brick .....	28
Turpentine:		Poles, telegraph .....	880
Crude .....	152	Croasties .....	1,875
Spirits .....	225		
Wood .....	3,500	<b>Total</b> .....	<b>13,384</b>
Timber .....	1,500		

Increase since last year, 3,521 tons.

Number of passengers, 210.

1114 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

*Statement of vessels navigating Town Creek, North Carolina, during the calendar year ending December 31, 1902.*

Class of vessels.	Number.	Aggregate net tonnage.	Draft in feet.
Steamers .....	1	31	4
Steam tugs .....	5	100	3.8 to 4.5
Sharpies .....	1	11	4
Flats (estimated) .....	12	300	3

N 14.

MODIFICATION OF HARBOR LINES ON TRENT RIVER AT NEWBERN, NORTH CAROLINA.

NEWBERN, N. C., *May 25, 1901.*

DEAR SIR: We, the undersigned owners of property in the city of Newbern, along the water front of Trent River, respectfully ask that the harbor line in front of our property be changed so as to correspond with and conform to the line on the accompanying blue print marked, "Proposed modification of harbor lines."

We are, with great respect,

J. W. MEMFINS.  
E. B. ELLIS.  
JAMES REDMOND.  
F. W. HUGHES.  
MRS. K. E. BRINSON.  
A. & N. C. RAILROAD COMPANY,  
By JAMES A. BRYAN, *President.*  
SHEPARD HEIRS,  
By JAMES A. BRYAN, *Agent.*  
E. K. BISHOP.  
R. P. WILLIAMS.

Hon. ELIHU ROOT,  
*Secretary of War, Washington, D. C.*

[First indorsement.]

U. S. ENGINEER OFFICE,  
*Newbern, N. C., August 7, 1902.*

Respectfully forwarded to Capt. E. W. Van C. Lucas, recommending approval.

S. F. BURBANK,  
*Assistant Engineer.*

[Second indorsement.]

U. S. ENGINEER OFFICE,  
*Wilmington, N. C., October 8, 1902.*

Respectfully forwarded to the Chief of Engineers, U. S. Army, Washington, D. C., with recommendation for approval.

The object of the proposed modification is to prevent the possibility of the closing in of the slip on the eastern side of the wharf next below railroad bridge by the prolongation to the present harbor line of the wharf next below.

The within petition is signed by all property owners along this water front, excepting two, Messrs. Henderson and Cutler, whose approval is indicated in separate communication herewith.

E. W. VAN C. LUCAS,  
*Captain, Corps of Engineers.*

[Third indorsement.]

OFFICE CHIEF OF ENGINEERS,  
U. S. ARMY,  
*October 23, 1902.*

Respectfully returned to Captain Lucas with request that the proposed modification be accurately described by courses and distances or otherwise to permit of its being transferred, if approved, to the original harbor-line chart on file in this office.

To be returned.

By command of Brig. Gen. Gillespie:

A. MACKENZIE,  
*Colonel, Corps of Engineers.*

[Fourth indorsement.]

U. S. ENGINEER OFFICE,  
*Wilmington, N. C., February 1, 1903.*

Respectfully returned to the Chief of Engineers, U. S. Army.

The proposed modification has been plotted on the inclosed tracing<sup>a</sup> as directed in third indorsement.

E. EVELETH WINSLOW,  
*Captain, Corps of Engineers.*

[Seventh indorsement.]

OFFICE CHIEF OF ENGINEERS,  
U. S. ARMY,  
*February 28, 1903.*

Respectfully forwarded to the Secretary of War.

This is a request for modification of the established harbor line of Trent River at Newbern, N. C., the object of the proposed modification being to prevent the possible closing in of a slip by the extension of a neighboring wharf to the present approved line.

The matter has been investigated by the local engineer officer and the consent obtained from all interested riparian owners.

I recommend that the harbor line be modified as proposed and that the Secretary of War place his approval upon the tracing herewith, which has been prepared for his signature.

G. L. GILLESPIE,  
*Brig. Gen., Chief of Engineers,*  
*U. S. Army.*

[Eighth indorsement.]

WAR DEPARTMENT, *March 2, 1903.*

Approved as recommended in the preceding indorsement.

E. ROOT,  
*Secretary of War.*

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<sup>a</sup> Not printed.



## APPENDIX O.

### IMPROVEMENT OF WACCAMAW RIVER, NORTH CAROLINA AND SOUTH CAROLINA, AND OF CERTAIN RIVERS AND HARBORS IN SOUTH CAROLINA.

REPORT FOR THE FISCAL YEAR ENDING JUNE 30, 1903, WITH OTHER DOCUMENTS RELATING TO THE WORKS. OFFICERS IN CHARGE, CAPT. J. C. SANFORD AND CAPT. G. P. HOWELL, CORPS OF ENGINEERS.

#### IMPROVEMENTS.

- |   |   |
|---|---|
| 1. Waccamaw River, North Carolina and South Carolina, and Little Pedee River, South Carolina. | 7. Harbor at Charleston, South Carolina.                                    |
| 2. Great Pedee River, South Carolina.   | 8. Wappoo Cut, South Carolina.  |
| 3. Winyah Bay, South Carolina.  | 9. Inland waterway between Charleston and Beaufort, South Carolina.         |
| 4. Santee, Wateree, and Congaree rivers, South Carolina.                                      | 10. Beaufort River, South Carolina.   |
| 5. Congaree River, South Carolina, from Gervais Street Bridge, Columbia, to Granby.           | 11. Removing sunken vessels or craft obstructing or endangering navigation. |
| 6. Inland waterways between Charleston Harbor, South Carolina, and opposite McClellanville.   |   |

UNITED STATES ENGINEER OFFICE,  
*Charleston, S. C., July 18, 1903.*

GENERAL: I have the honor to transmit herewith my annual reports for the fiscal year ending June 30, 1903, for the works of improvement of rivers and harbors in this district.

Very respectfully,

G. P. HOWELL,  
*Captain, Corps of Engineers.*

Brig. Gen. G. L. GILLESPIE,  
*Chief of Engineers, U. S. A.*

#### O 1.

### IMPROVEMENT OF WACCAMAW RIVER, NORTH CAROLINA AND SOUTH CAROLINA, AND LITTLE PEDEE RIVER, SOUTH CAROLINA.

#### (a) WACCAMAW RIVER.

Work during the year consisted in snagging and removing other obstructions. It is proposed to apply the available balance in main-



1118 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

taining the improvement and dredging at the worst shoals below Conway.

*Money statement.*

November 1, 1902 (allotted) <sup>a</sup> .....	\$9,000. 00
July 1, 1902, balance unexpended .....	275. 50
	<hr/>
June 30, 1903, amount expended during fiscal year .....	9,275. 50
	1,797. 95
	<hr/>
July 1, 1903, balance unexpended .....	7,477. 55
July 1, 1903, outstanding liabilities .....	1,313. 53
	<hr/>
July 1, 1903, balance available .....	6,164. 02
	<hr/>
(Amount (estimated) required for completion of existing project.....	26,500. 00
Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903:	
For works of improvement .....	\$15,000. 00
For maintenance of improvement.....	8,000. 00
	<hr/>
	23,000. 00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

For this improvement the following appropriations have been made:

By act of Congress—	By act of Congress—
Approved June 14, 1880.....\$15,000	Approved July 13, 1892..... \$10,000
Approved March 3, 1881..... 10,000	Of August 18, 1894..... 6,000
Passed August 2, 1882..... 4,400	Of June 3, 1896..... 6,000
Approved July 5, 1884..... 6,000	Approved March 3, 1899... 3,000
Approved August 5, 1886..... 15,000	Approved June 13, 1902.... 9,000
Of August 11, 1888..... 15,000	
Approved September 19, 1890 12,500	Total .....
	111,900

Total expenditures, including June 30, 1903, \$104,422.45.

COMMERCIAL STATISTICS, 1902.

Articles.	Quantity.	Value.
OUTWARD FREIGHTS.		
	<i>Tons.</i>	
Naval stores.....	7,620	\$165,082
Cotton .....	875	175,000
Timber, lumber, etc.....	119,600	535,027
Fish, game, and vegetables.....	300	30,000
Rice and rice flour.....	4,500	251,844
Miscellaneous.....	1,200	98,191
Total .....	134,095	1,255,094
INWARD FREIGHTS.		
Miscellaneous merchandise and fertilizers.....	7,591	568,925
Grand total .....	141,686	1,844,019

<sup>a</sup> From river and harbor act of June 13, 1902.

*List of vessels plying on Waccamaw River, South Carolina, during the calendar year 1902.*

Name.	Character.	Length.	Breadth.	Depth.	Gross tonnage.
		<i>Feet.</i>	<i>Feet.</i>	<i>Feet.</i>	
Gov. Safford .....	Side-wheel steamer .....	129.6	26	7.5	307
Merchant .....	do .....	147.7	29.6	5.4	406
Ruth .....	do .....	81	26	4	89
F. G. Burroughs .....	do .....	125	22	6	283
Jno. M. Cole .....	do .....	180	39.6	5	318
William Elliot .....	do .....	101	31	6	171
Eutaw .....	do .....	156	29.8	7.8	547
Planter .....	do .....	155	32.8	9.1	499
Wm. P. Congdon .....	Screw tug .....	75.2	18	7.8	68
S. S. Brewster .....	do .....	77.5	18.5	7.6	50
Martha Helen .....	do .....	82	16.7	7.4	75
Bon Accord .....	do .....	67.3	14.4	5	42
Henry Lloyd .....	do .....	40.5	12.2	4.8	13
Fearless .....	do .....	58	11	4	18
Emma A. Twiggs .....	do .....	53	13.2	4.5	16
Pender .....	do .....	52.7	14.9	3.4	28
Bertie .....	do .....	49.5	9.8	3.5	16
Robt. E. Lee .....	do .....	67	17	4.5	56
Elmore A. Kent .....	do .....	77.7	18.8	9.2	87
Louisa .....	Stern-wheel steamer .....	101	25	5	280
Frank Sessoms .....	do .....	86.6	22.8	3.6	79
Pelican .....	Naptha launch .....	30	7	2.5	3
Maria C .....	Yacht .....	85	10	4.5	8
Willie .....	do .....	40	9	4	a 6
Madge .....	do .....	35	7	2	a 3
Sprite .....	do .....	37	8	3	a 5
Lellah .....	do .....	40	8	3	a 5
Advance .....	do .....	25	5.5	1.5	a 2
Loretta .....	do .....	40	9	3	a 7
Almont .....	do .....	40	8	5	a 4
Socastee .....	Barge .....	47	12	4	16
Enterprise .....	do .....	41.5	12	3.5	17
Myra W. Spear .....	Schooner .....	99.2	27.6	7.5	156
Eva A. Danenhower .....	do .....	116.6	30.2	8.7	228
Robt. McClintock .....	do .....	96	26.7	7.4	154
Bayard Hopkins .....	do .....	118	30	9	269
Wm. Linthicum .....	do .....	112	27.6	8	156
Chas. Linthicum .....	do .....	104	26.4	8.2	131
Venus .....	do .....	108	29.4	9.1	204
John Russell .....	do .....	66.2	22.2	4.7	86
Crescent .....	do .....	150.8	34.8	12.4	463
Edward L. Martin .....	do .....	87.2	23.6	6.8	84

<sup>a</sup> Approximately.

(b) LITTLE PEDEE RIVER.

No work was done during the year except care and maintenance of plant. It is proposed to expend the available balance in snagging the stream, maintaining first the portion previously improved.

*Money statement.*

November 1, 1902 (allotted) <sup>a</sup> .....	\$1,500.00
July 1, 1902, balance unexpended .....	41.30
	1,541.30
June 30, 1903, amount expended during fiscal year .....	93.38
July 1, 1903, balance unexpended .....	1,447.92
(Amount (estimated) required for completion of existing project .....	26,500.00
Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903:	
For works of improvement .....	\$5,000.00
For maintenance of improvement .....	3,000.00
	8,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

<sup>a</sup> From river and harbor act, June 13, 1902.

# 1120 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

For this improvement the following appropriations have been made:

By act of Congress—		
Of August 11, 1888 .....		\$5, 000
Approved September 19, 1890 .....		5, 000
Approved July 13, 1892 .....		5, 000
Of August 18, 1894 .....		4, 000
Of June 3, 1896 .....		3, 000
Approved June 13, 1902 .....		1, 500
<b>Total .....</b>		<b>23, 500</b>

Total expenditures, including June 30, 1903, \$22,052.08.

## COMMERCIAL STATISTICS, 1902.

Articles.	Quantity.	Value.
<b>OUTWARD FREIGHTS.</b>		
	<i>Tons.</i>	
Naval stores .....	300	\$9, 000
Cotton .....	200	32, 000
Lumber, timber, and cord wood .....	55, 000	830, 000
<b>Total .....</b>	<b>55, 500</b>	<b>371, 000</b>
<b>INWARD FREIGHTS.</b>		
Fertilizers .....	1, 300	32, 500
Miscellaneous .....	250	12, 500
<b>Grand total .....</b>	<b>57, 050</b>	<b>416, 000</b>

List of vessels plying on Little Pee Dee River, South Carolina, during the calendar year 1902.

Name.	Character.	Length.	Breadth.	Draft.	Gross tonnage.
		<i>Feet.</i>	<i>Feet.</i>	<i>Feet.</i>	
Ruth .....	Side-wheel steamer .....	81	26	4	89
Almont .....	Yacht .....	40	8	5	4
6-pole flats .....		65	14	8	30

## O 2.

### IMPROVEMENT OF GREAT PEDEE RIVER, SOUTH CAROLINA.

No work was done during the year until June, 1903, when a snag boat was put at work removing obstructions from the river which had previously been snagged.

It is proposed to spend the available balance and the funds appropriated in maintaining the general improvement and in obtaining the channel in the upper river as provided for in the project. (See page 245, Annual Report of the Chief of Engineers for 1903.)

*Money statement.*

July 1, 1902, balance unexpended .....	\$22,804.82
Amount appropriated by sundry civil act approved March 3, 1903.....	40,000.00
	<hr/>
June 30, 1903, amount expended during fiscal year .....	62,804.82
	<hr/>
July 1, 1903, balance unexpended .....	60,546.44
July 1, 1903, outstanding liabilities .....	500.31
	<hr/>
July 1, 1903, balance available .....	60,046.13
	<hr/>
{ Amount (estimated) required for completion of existing project .....	66,300.00
{ Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903:	
For works of improvement.....	\$40,000.00
For maintenance of improvement .....	5,000.00
	<hr/>
	45,000.00
{ Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

For this improvement the following appropriations have been made:

By act of Congress—		By act of Congress—	
Approved June 14, 1880.....	\$7,000	Of August 18, 1894.....	\$6,000
Approved March 3, 1881.....	6,000	Passed June 3, 1896.....	12,000
Passed August 2, 1882.....	6,000	Approved March 3, 1899....	4,000
Approved July 5, 1884.....	8,000	Approved June 13, 1902....	22,500
Approved August 5, 1886.....	20,000	Approved March 3, 1903....	40,000
Of August 11, 1888.....	20,000		
Approved September 19, 1890..	12,500	Total .....	174,000
Approved July 13, 1892.....	10,000		

Total expenditures, including June 30, 1903, \$113,453.56.

## COMMERCIAL STATISTICS, 1902.

Articles.	Quantity.	Value.
<b>OUTWARD FREIGHTS.</b>		
Naval stores.....	<i>Tons.</i> 786	\$22,388
Cotton .....	1,775	275,175
Lumber, timber, and cross-ties.....	140,564	563,187
Rice .....	2,000	90,000
Miscellaneous.....	553	23,020
Total.....	145,678	973,720
<b>INWARD FREIGHTS.</b>		
Miscellaneous merchandise and fertilizers.....	6,390	355,250
Grand total .....	152,008	1,328,970

## 1122 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

*List of vessels plying on Great Pee Dee River, South Carolina, during the calendar year 1902.*

Name.	Character.	Length.	Breadth.	Depth.	Gross tonnage.
		<i>Feet.</i>	<i>Feet.</i>	<i>Feet.</i>	
Merchant.....	Side-wheel steamer.....	147.7	29.6	5.4	405
Jno. M. Cole.....	do.....	130	39.6	5	318
Louisa.....	Stern-wheel steamer.....	101	25	5	280
Frank Seasons.....	do.....	86.6	22.8	3.6	79
Wm. P. Congdon.....	Screw tug.....	75.2	18	7.8	68
S. S. Brewster.....	do.....	77.5	18.5	7.6	50
Martha Helen.....	do.....	82	16.7	7.4	75
Bon Accord.....	do.....	67.3	14.4	5	42
Henry Llyod.....	do.....	40.5	12.2	4.8	13
Fearless.....	do.....	58	11	4	18
Emma A. Twiggs.....	do.....	53	13.2	4.5	16
Pender.....	do.....	52.7	14.9	3.4	28
Bertie.....	do.....	49.5	9.8	3.5	16
Robt. E. Lee.....	do.....	67	17	4.5	56
Willie.....	Yacht.....	40	9	4	a 6
Madge.....	do.....	35	7	2	a 3
Sprite.....	do.....	37	8	3	a 5
Lellah.....	do.....	40	8	3	a 5
Loretta.....	do.....	40	9	3	a 7
Maria C.....	do.....	35	10	4.5	a 8
Pelican.....	Naphtha launch.....	30	7	2.5	a 3
Myra W. Spear.....	Schooner.....	99.2	27.6	7.5	156
Eva A. Danenhower.....	do.....	116.6	30.2	8.7	228
Robt. McClintock.....	do.....	96	26.7	7.4	154
Bayard Hopkins.....	do.....	118	30	9	269
Wm. Linthicum.....	do.....	112	27.6	8	156
Chas. Linthicum.....	do.....	104	26.4	8.2	181
Venus.....	do.....	108	29.4	9.1	204
John Russell.....	do.....	66.2	22.2	4.7	36
Crescent.....	do.....	150.8	34.8	12.4	463
Edward L. Martin.....	do.....	87.2	23.6	6.8	84
Elmore A. Kent.....	Screw tug.....	77.7	18.8	9.2	87

a Approximate.

## O 3.

## IMPROVEMENT OF WINYAH BAY, SOUTH CAROLINA.

Jetty construction under continuing contract with Mr. R. G. Ross was completed November 12, 1902.

The south jetty has been extended seaward to its proposed outer end, the crest being brought up to high-water level only, and a mound at the seaward end with crest 12 feet above mean low water has been completed. For 1,240 linear feet of the jetty near its shoreward end it has been raised to 10 feet above mean low water. Some settlement has occurred, particularly in the outer 5,000 feet, and in the seaward mound, which stands now at a height of about 4 feet at mean low water. This lowering of the crest is caused mainly by wave action. A number of mattresses were sunk on the north side of the jetty foundation and some additional stone placed on mattresses sunk in former years.

The north jetty was completed to its seaward end; its length is 11,139 feet and its crest was built to 6 feet above mean low water. A mound 12 feet above mean low water was built at its outer end. This jetty has also settled.

The dredge *Winyah Bay* was returned to the district and resumed work October 16, 1902, and work was continued until January 25, 1903, 78,919 cubic yards of material being removed. The dredge was then ordered from the district, and at the close of the fiscal year had not returned.

The accompanying map<sup>a</sup> of survey just made shows that the project depth of 15 feet has been attained throughout the entire channel. The ruling depth at the date of the last annual report was 13.9 feet. Range lights have been established by the Light-House Establishment, as shown. At the seaward entrance to the South Jetty channel the width is over 1,000 feet, which soon narrows to 700 feet. The least width is 300 feet, where last year there was a depth of only 13.9 feet. In the Middle Ground channel the channel is narrower, 150 feet in two localities, and does not follow exactly the lighted range.

For details of the work, reference is made to the accompanying report of Assistant Engineer Reid Whitford, who has been in local charge of the work.

The sundry civil act approved March 3, 1903, contains the following item:

Improving Winyah Bay, South Carolina: For continuing improvement of harbor at Winyah Bay, one hundred thousand dollars.

It is proposed to expend the available balance in the shoreward extension of the south jetty, in dredging in the entrance channel, and in deepening the shoal places between the entrance and the city of Georgetown, as the depth at the entrance is greater than on the shoals in the bay.

*Money statement.*

July 1, 1902, balance unexpended .....	\$392, 077. 44
Amount appropriated by sundry civil act approved March 3, 1903 .....	100, 000. 00
	<u>492, 077. 44</u>
June 30, 1903, amount expended during fiscal year .....	258, 803. 98
July 1, 1903, balance unexpended .....	233, 273. 46
July 1, 1903, outstanding liabilities .....	2, 797. 41
July 1, 1903, balance available .....	<u>230, 476. 05</u>
{ Amount (estimated) required for completion of existing project .....	217, 750. 00
{ Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903:	
For works of improvement .....	\$120, 000. 00
For maintenance of improvement .....	90, 000. 00
	<u>210, 000. 00</u>
{ Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

Amount and date of all appropriations for this work are as follows:

By act of Congress—	
Approved August 5, 1886 .....	\$18, 750. 00
Of August 11, 1888 .....	100, 000. 00
Approved September 19, 1890 .....	100, 000. 00
Approved July 13, 1892 .....	100, 000. 00
Of August 18, 1894 .....	110, 000. 00
Passed June 3, 1896 .....	20, 000. 00
Approved June 4, 1897 .....	350, 000. 00
Approved July 1, 1898 .....	450, 000. 00
Approved March 3, 1899 .....	58, 500. 00
Approved June 6, 1900 .....	285, 000. 00
Approved March 3, 1901 .....	500, 000. 00
Approved June 28, 1902 .....	35, 000. 00
Received on account of Treasury settlement No. 31207 .....	33. 76
Approved March 3, 1903 .....	100, 000. 00
Total .....	<u>2, 227, 283. 76</u>
Total expenditures, including June 30, 1903, \$1,994,010.30.	

<sup>a</sup> Not printed.

# 1124 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

## LIST OF CONTRACTS IN FORCE.

Contract for—	Name of contractor.	Date of approval.	Date of beginning.	Date of completion.
Constructing jetties.....	B. G. Ross.....	June 10, 1897	July 1, 1897	a July 1, 1902

## EMERGENCY CONTRACTS.

Contract for—	Name of contractor.	Date of contract.	Date of beginning.	Date of completion.
About 600 tons coal.....	Consumers Coal Co.....	Dec. 23, 1902	Dec. 28, 1902	Jan. 13, 1903

a Time limit for completion of contract waived.

## COMMERCIAL STATISTICS, 1902.

Articles.	Quantity.	Value.
OUTWARD FREIGHTS.		
Naval stores.....	Tons. 16,286	\$355,551
Cotton.....	4,577	611,860
Rice.....	5,250	390,000
Lumber, shingles, and cross-ties.....	317,339	2,145,241
Fish, game, and vegetables.....	1,780	178,000
Miscellaneous.....	1,239	1,680,000
Total.....	346,471	5,310,682
INWARD FREIGHTS.		
Miscellaneous.....	41,000	4,000,000
Grand total.....	387,471	9,310,682

List of vessels at and entering port of Georgetown, S. C., during calendar year 1902.

Name.	Character.	Length.	Breadth.	Depth.	Gross tonnage.
		<i>Feet.</i>	<i>Feet.</i>	<i>Feet.</i>	
Waccamaw.....	Screw steamship.....	256	42	14	1,359
Georgetown.....	do.....	256	42	14	1,359
Saginaw.....	do.....	238	34.3	17.1	1,535
Richmond.....	do.....	206	33	21.6	1,437
Onaida.....	do.....	205.8	29.9	18.6	1,322
Geo. W. Clyde.....	do.....	256	35	19.2	1,848
Katahdin.....	do.....	239.1	38	14	1,380
Aragon.....	do.....	247.7	42.6	14.8	1,450
Farwell.....	do.....	212.3	35.6	19.6	1,200
Wm. P. Congdon.....	Screw steamer.....	75.2	18.2	7.8	68
S. S. Brewster.....	do.....	77.5	18.5	7.6	50
Martha Helen.....	do.....	82	16.7	7.4	75
Bon Accord.....	do.....	67.3	14.4	5	42
Henry Lloyd.....	do.....	40.5	12.2	4.8	13
Fearless.....	do.....	58	11	4	18
Emma A. Twiggs.....	do.....	53	13.2	4.5	16
Pender.....	do.....	52.7	14.9	3.4	28
Bertie.....	do.....	49.5	9.8	3.5	16
E. T. Williams.....	do.....	81	21	9	97
Robt. E. Lee.....	do.....	67	17	4.5	56
Elmore A. Kent.....	do.....	77.7	18.8	9.2	87
Two Brothers.....	Stern-wheel steamer.....	75.1	30.1	5.4	97
Louisa.....	do.....	101	25	5	280
Frank Sessoms.....	do.....	86.6	22.8	3.6	79
Gardenia.....	do.....	75	12.6	3.2	34
Merchant.....	Side-wheel steamer.....	147.7	29.6	5.4	405
Gov. Safford.....	do.....	129.6	26	7.5	307
Ruth.....	do.....	81	26	4	89

*List of vessels at and entering port of Georgetown, S. C., during calendar year 1902—C't'd.*

Name.	Character.	Length.	Breadth.	Depth.	Gross tonnage.
		<i>Feet.</i>	<i>Feet.</i>	<i>Feet.</i>	
F. G. Burroughs.....	Side-wheel steamer	125	22	6	283
John M. Cole.....	do	130	39.6	5	318
Wm. Elliot.....	do	101	81	6	171
Eutaw.....	do	156	29.8	7.8	547
Planter.....	do	155	32.8	9.1	499
Willie.....	Yacht	40	9	4	α6
Madge.....	do	35	7	2	α8
Sprite.....	do	37	8	3	α5
Leilah.....	do	40	8	3	α5
Advance.....	do	25	5.5	1.5	α2
Loretta.....	do	40	9	3	α7
Husted.....	do	42	8	3	α5
Syra.....	do	36	7	3	α8
Thistle.....	do	43.6	11.5	3.9	13
Almont.....	do	40	8	5	4
Maria C.....	do	35	10	4.5	8
Petrel.....	do	40	10	3.5	9
Pelican.....	Naphtha launch	30	7	2.5	3
Wapella.....	do	30	7	2.5	3
Etta.....	Sloop	47	11	3.3	8
Clipper.....	do	31	11	2.9	10
Lella.....	do	31	10	2.5	8
Liza Jane.....	do	40.8	12.5	4.9	17
Socastee.....	Barge	47	12	4	16
Enterprise.....	do	41.5	12	3.5	17
Winyah.....	Schooner	43.2	16.4	6.1	18
Blanch Creamer.....	do	46.1	14.4	4	15
We Go.....	do	44	13.7	4.3	18
Hugh.....	do	47.6	14.2	3.4	14
Waccamaw.....	do	137.7	33.3	14.5	458
Bayard Hopkins.....	do	118	30	9	269
William Linthicum.....	do	112	27.6	8	156
Robt. McClintock.....	do	96	26.7	7.4	154
E. A. Danenhower.....	do	116.6	30.2	8.7	228
Warren B. Potter.....	do	130	32.4	12	368
Chas. H. Sprague.....	do	122	30.7	9.5	318
Myra W. Spear.....	do	99.2	27.6	7.5	156
Edward L. Martin.....	do	87.2	23.6	6.8	84
Rebecca R. Douglass.....	do	138.8	33.9	9.5	475
Nellie Floyd.....	do	136	33	15.4	457
Percy & Lillie.....	do	141	33.5	14.1	503
Golden Ball.....	do	124.2	30.3	10.5	286
Chas. Linthicum.....	do	104	26.4	8.2	131
J. A. Beckerman.....	do	140.7	34.2	16.1	485
Venus.....	do	108	29.4	9.1	204
Sarah D. J. Rawson.....	do	140.5	34.8	11.1	387
John Russell.....	do	66.2	22.2	4.7	36
William Churchill.....	do	143.6	34.7	11	432
J. H. Leeds.....	do	134.5	34.8	11.5	414
S. C. Hall.....	do	147.8	35	11	384
Greenleaf Johnson.....	do	141.5	35	12.6	390
H. G. Morse.....	do	147.6	34.4	10.8	437
Crescent.....	do	150.8	34.8	12.4	463
P. Satisfaction.....	do	154.5	35	12.5	524
James Rathwell.....	do	151.1	35	14.3	498
C. C. Lane.....	do	130	32	11	321
Norunbega.....	do	137.5	32	9.5	310
H. Lawrence.....	do	168.4	35.2	15.1	770
Knowlton.....	do	128.7	33.5	11.1	317
B. I. Hazard.....	do	131.8	31.1	8.4	392
F. C. Pendleton.....	do	145.7	33.2	12.3	408
Ida C. Schoolcraft.....	do	134.3	32.6	9.6	320
E. C. Allen.....	do	144.2	34.6	15.1	499
John B. Page.....	do	127	31.5	9.6	397
Lottie R. Russell.....	do	122.8	32.6	9.9	304
John A. Curtis.....	do	111.2	23.6	8.5	155
Jessie Barlow.....	do	120.6	30.4	11.1	276
F. W. McCullough.....	do	97.4	26	7.6	127
Wm. P. Hood.....	do	158.4	36.4	16.9	665
Kate Darlington.....	do	97.8	28	7.1	135
Grace Seymour.....	do	166	34.2	16	633
City of Georgetown.....	do	158	36	12	596

α Approximate.



# 1126 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

REPORT OF MR. REID WHITFORD, ASSISTANT ENGINEER.

UNITED STATES ENGINEER OFFICE,  
*Georgetown, S. C., June 30, 1903.*

CAPTAIN: I have the honor to report as follows on improving Winyah Bay, South Carolina, for fiscal year ending June 30, 1903:

Contract with R. G. Ross for jetty work was completed November 12, 1902. The following work was done on south jetty: 24,069.39 tons large stone and 14,679.12 tons ballast stone placed. This extended the superstructure of the jetty to the 26-foot contour at sea at mean low water, raising its crest to about 3 feet above mean low water to station 237 + 23, its seaward end, making its total length 21,051 feet from its shore end on South Island beach (the other stations being used on the land at South Island, which are not included in the stonework).

Built 3 mounds 8 feet above high water (or 12 feet above mean low water), to plainly define the line of jetty at high water—one at the outer end, one at the intersection of the south jetty channel, and the third one between these two.

The original height of the jetty was as follows, with crest as narrow as large stones could be made to stand after being roughly placed from derrick slings: From station 26 + 72, its South Island shore end, to station 42 (stations being 100 feet apart) it was built to an elevation of 10 feet above mean low water; from station 42 to station 185 it was built 6 feet above mean low water; from station 185 to station 212 it was built from 4 to 5 feet above mean low water; from station 212 to station 236 + 23 it was built to about 3 feet above mean low water; the last 100 feet of jetty—station 236 + 23 to station 237 + 23—submerged at low water. The present condition of the jetty from the South Island shore to its seaward end is as follows:

From station 26 + 72 to station 42, practically unchanged; from station 42 to station 157 + 63 the jetty has lowered for about 2,000 feet to 3 feet above mean low water, and the remaining 9,563 feet is now about 5 feet above mean low water (the 2,000 feet are aggregated by low places in the total distance); from station 157 + 63 to station 196 + 43 the jetty has lowered in height to 3 to 4½ feet above mean low water; from station 196 + 43 to station 235 + 23 the jetty has lowered in height to about 2 feet above mean low water for 880 feet and to about low water for the remaining 3,000 feet. The seaward mound has lowered in height to about 4 feet above mean low water, only a small portion of it showing at that stage of water. The inner and middle mounds have not settled to any extent.

The depression in height of jetty noted is not only due to settling, but also to a great extent by the toppling of capstones caused by the surging of heavy northeast gale waves.

This was anticipated in the plans, which provided that the jetty was to be restored to its desired height from time to time as the necessity of the case required, till it assumed a natural slope on both sides and attained a fixed width and crest.

## NORTH JETTY.

The following work was done on the north jetty, completing it to its adopted seaward end at station 111 + 39, making the length of jetty 11,139 feet from its landward end on North Island, the following stone being used: 34,449.65 tons of large and 2,291.71 tons ballast (total stone used on both jetties, 58,519.04 tons large and 16,970.83 tons ballast). This built the entire crest of jetty 6 feet above mean low water, with a mound 8 feet above high water or 12 feet above mean low water marking its outer end, the last 100 feet (the slope) being submerged at mean low water.

The present condition of the jetty from its shoreward end on North Island to its seaward end is as follows:

Station 0 is on shore, about 1,000 feet beyond high-water mark. From station 0 to station 10 the jetty remains practically unchanged. From station 10 to station 35 it has lowered in height to 3½ to 4½ feet above mean low water. From station 35 to station 45 it has lowered in height to 4½ to 5 feet above mean low water. From station 45 to station 69 + 60 there is no appreciable change. From station 69 + 60 to station 110 the jetty has lowered in height to about 4½ feet above mean low water, except for a distance aggregating 500 feet, which has lowered in height to about 1 foot above mean low water. The mound at seaward end has lowered in height to about 8 feet above mean low water.

The depression in height of jetty, as noted, is not only due to settling, but also in great part by the toppling of capstones, caused by the surging of heavy northeast gale waves, which was anticipated in the plans, which provided that the jetty was to be restored to its desired height from time to time as the necessity of the case required, till it assumed a natural slope on both sides and attained a fixed width and crest.

So far as it has been possible to determine by cross sections, neither of the jetty's foundations shows any special danger at present of being undermined by the action of the currents.

Owing to the almost continuous absence of the dredge *Winyah Bay* during the year from her regular work at North Island, being used in other harbors, only 78,919.07 cubic yards of material were removed—from the Middle Ground and South Jetty channel—the dredge not being available at all for work on shoals in upper bay.

As will be observed from accompanying tracing, made from annual survey of jetty channels just completed, there is a clear channel depth of 15 feet at mean low water entirely through the shoals, at the entrance to the bay, to the ocean.

This is the depth provided for in the present approved project.

The following work was done on the extension of mud dike on South Island in a southerly direction toward Pine Ridge: 5,178.1 cubic yards material, completing 713 linear feet of dike to full dimensions; 888 cubic yards material, completing 200 linear feet of dike to partial dimensions; 839 square yards of grass sod; 4,165 square yards of grass sod used in repairing the old dike already built.

All this work on dikes has been done by hired labor with wheelbarrows. A clam-shell dredge will soon be put to work there, when it is expected to hasten the dike to completion within a reasonable time.

Other work has been: Repairs to dredges and making preparations to begin dredging shoals in upper bay as provided for in river and harbor bill of June 13, 1902; repairs to and reconstruction of dredge for extension of South Island mud dike; survey of shoals in Winyah Bay, repairs to and maintenance of plant; cross sectioned both jetties for the purpose of getting records of their heights of crest and slopes of sides, to determine if foundations were undercutting.

Of the total amount expended on the entire work, about 14½ per cent was for maintenance and 85½ per cent for improvement.

The very gratifying result of the work shown by increased depth to 15 feet, from original depth of 9 feet at mean low water, has given an impetus to the commerce of the port, and increased the value of it to a considerable extent.

Very respectfully, your obedient servant,

REID WHITFORD, *Assistant Engineer.*

Capt. G. P. HOWELL,  
*Corps of Engineers.*

#### O 4.

#### IMPROVEMENT OF SANTEE, WATEREE, AND CONGAREE RIVERS, SOUTH CAROLINA.

##### (a) SANTEE RIVER.

No work was done during the year except care and maintenance of plant.

It is proposed to apply the available balance to widening and deepening the Estherville-Minim Creek Canal in accordance with the project, and to keep the Santee River proper clear of snags.

##### *Money statement.*

November 1, 1902 (allotted) <sup>a</sup>	\$15,000.00
June 30, 1903, amount expended during fiscal year	4,185.32
July 1, 1903, balance unexpended	10,814.68
July 1, 1903, outstanding liabilities	847.94
July 1, 1903, balance available	9,966.74
(Amount (estimated) required for completion of existing project	167,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903:	
For works of improvement	\$40,000.00
For maintenance of improvement	15,000.00
	55,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

<sup>a</sup> From river and harbor act June 13, 1902.

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For this improvement the following appropriations have been made:

By act of Congress—		By act of Congress—	
Approved March 3, 1881....	\$22,000	Of August 18, 1894 .....	\$40,000
Passed August 3, 1882 .....	20,000	Passed June 3, 1896 .....	48,000
Approved July 15, 1884.....	15,000	Approved March 3, 1899....	20,000
Approved August 5, 1886 ..	18,750	Approved June 13, 1902 ...	15,000
Of August 11, 1888 .....	24,000		
Approved September 19, 1890	30,000	Total .....	282,750
Approved July 13, 1892.....	30,000		

Total expenditures, including June 30, 1903, \$271,935.32.

COMMERCIAL STATISTICS, 1902.

Articles.	Quantity.	Value.
<b>OUTWARD FREIGHTS.</b>		
Naval stores .....	<i>Tons.</i> 20,000	\$360,000
Cotton .....	700	150,000
Lumber, timber, and cord wood.....	150,000	330,000
Rice and rice flour.....	27,000	130,000
Fish, game, and vegetables.....	50	2,500
Miscellaneous .....	850	35,000
Total.....	198,100	1,007,500
<b>INWARD FREIGHTS.</b>		
Miscellaneous .....	17,500	875,000
Grand total .....	215,600	1,882,500

List of vessels plying on Santee River, South Carolina, during the calendar year 1902.

Name.	Character.	Length.	Breadth.	Depth.	Draft loaded.	Gross tonnage.
		<i>Fect.</i>	<i>Fect.</i>	<i>Fect.</i>	<i>Fect.</i>	
Jno. M. Cole.....	Side-wheel steamer.....	130	39.6	5.		318
Eutaw .....	do .....	156	29.8	7.8		547
Frank Sessoms .....	Stern-wheel steamer .....	86.6	22.8	3.6		79
Gardenia .....	do .....	75	12.6	3.2		84
Otto .....	Screw tug .....	31.3	11.2	3.7		10
Pender .....	do .....	52.7	14.9	3.4		28
Janie .....	do .....	42.8	10.5	4.5		17
Willie .....	Yacht .....	40	9	4		6
Loretta .....	do .....	40	9	3		7
Pelican .....	Launch .....	30	7	2.5		3
Etta .....	Sloop .....	47	11	3.3	3	8
Flora Temple .....	do .....	34.8	12.8	3.3	3	7
Clipper .....	do .....	31	11	2.9	2	10
Lella .....	do .....	31	10	2.5	2	8
Liza Jane .....	do .....	40.8	12.5	4.9	4	17
We Go .....	Schooner .....	44	13.7	4.3	4	18
Hugh .....	do .....	47.6	14.2	3.4	3	14

(b) WATEREE RIVER.

No work was done during the year except care of plant.

The river and harbor act approved June 13, 1902, suspended work on the river until further action by Congress.

*Money statement.*

July 1, 1902, balance unexpended .....	\$219. 41
June 30, 1903, amount expended during fiscal year .....	28. 68
July 1, 1903, balance unexpended .....	190. 75
<hr/>	
Amount that can be profitably expended in fiscal year ending June 30, 1905, for maintenance of improvement, in addition to the balance unexpended July 1, 1903 .....	7, 000. 00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

For this improvement the following appropriations have been made:

By act of Congress—	By act of Congress—
Approved March 3, 1881 .... \$8, 000	Approved July 13, 1892..... \$2, 500
Passed August 2, 1882 ..... 15, 000	Of August 18, 1894..... 2, 500
Approved July 5, 1884..... 5, 000	Passed June 3, 1896..... 5, 000
Approved August 5, 1886..... 7, 500	Approved March 3, 1899..... 2, 500
Of August 11, 1888..... 12, 000	
Approved September 19, 1890. 12, 500	Total ..... 72, 500

Total expenditures, including June 30, 1903, \$72,309.25.

COMMERCIAL STATISTICS, 1902.

Articles.	Quantity.	Value.
OUTWARD FREIGHTS.		
Timber.....	Tons. 42, 500	\$85, 000
INWARD FREIGHTS.		
Miscellaneous merchandise.....	75	7, 500
Grand total .....	42, 575	92, 500

*List of vessels plying on Wateree River, South Carolina, during the calendar year 1902.*

Name.	Character.	Length.	Breadth.	Depth.	Gross tonnage.
		Feet.	Feet.	Feet.	
Steamer Janie.....	Screw tug .....	42. 8	10. 5.	4. 5	17

(c) CONGAREE RIVER.

Snagging was carried on from February to May, 1903.

It is proposed to expend the available balance in keeping the river clear of snags, and in deepening and widening the channel to the dimensions contemplated by the project, so far as funds will permit.

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## Money statement.

November 1, 1902 (allotted) <sup>a</sup> .....	\$5,000.00
July 1, 1902, balance unexpended .....	299.18
	<hr/>
June 30, 1903, amount expended during fiscal year .....	5,299.18
	<hr/>
July 1, 1903, balance unexpended .....	3,475.63
	<hr/>
{ Amount (estimated) required for completion of existing project .....	18,500.00
{ Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903:	
For works of improvement .....	\$5,000.00
For maintenance of improvement .....	3,000.00
	<hr/>
	8,000.00
{ Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

For this improvement the following appropriations have been made:

By act of Congress—	
Approved August 5, 1886 .....	\$7,500
Of August 11, 1888 .....	7,500
Approved September 19, 1890 .....	5,000
Approved July 13, 1892 .....	5,000
Of August 18, 1894 .....	4,000
Passed June 3, 1896 .....	2,000
Approved June 13, 1902 .....	5,000
	<hr/>
Total .....	36,000

Total expenditures, including June 30, 1903, \$32,524.37.

## COMMERCIAL STATISTICS, 1902.

Articles.	Quantity.	Value.
<hr/>		
OUTWARD FREIGHTS.		
Timber .....	Tons. 58,000	\$116,000
INWARD FREIGHTS.		
Miscellaneous merchandise .....	75	7,500
Grand total .....	58,075	123,500

List of vessels plying on Congaree River, South Carolina, during the calendar year 1902.

Name.	Character.	Length.	Breadth.	Depth.	Gross tonnage.
		<i>Fcet.</i>	<i>Fcet.</i>	<i>Fcet.</i>	
Janie .....	Screw tug .....	42.8	10.5	4.5	17

## O 5.

IMPROVEMENT OF CONGAREE RIVER, SOUTH CAROLINA, FROM GERVAIS STREET BRIDGE, COLUMBIA, TO GRANBY.

Work of building the lock and abutment under the contract approved October 20, 1900, with The Evansville Contract Company, was continued.

<sup>a</sup> River and harbor act, June 13, 1902.

The work was seriously delayed by numerous freshets, and a waiver of the original time limit for completion, January 30, 1902, was authorized by the Department January 11, 1902. With the exception of some paving and crib extension, the contract is completed. The four leaves of the steel lock gates were built and are ready to be placed. Contract for erecting 376 feet of Chanoine movable dam, without navigable pass, to extend from the lock to the abutment, was entered into with The Evansville Contract Company October 2, 1902, the work to be completed within 150 working days. The contract price was \$65,875. Beyond preparing the plant, little work was done.

For details of the work reference is made to the appended report of Assistant Engineer W. A. Leland, who has been in local charge of the work throughout the year.

It is proposed to expend the available balance in completing the lock and movable dam and in clearing the channel between the lock and dam and Columbia of bowlders and other obstructions.

*Money statement.*

July 1, 1902, balance unexpended .....	\$193, 423. 12
June 30, 1903, amount expended during fiscal year .....	52, 541. 35
July 1, 1903, balance unexpended .....	140, 881. 77
July 1, 1903, outstanding liabilities .....	6, 523. 70
July 1, 1903, balance available .....	134, 358. 07
July 1, 1903, amount covered by uncompleted contracts .....	75, 092. 70

Amount and date of all appropriations for this work are as follows:

By act of Congress—

Approved March 3, 1899 .....	\$50, 000
Approved June 6, 1900 .....	100, 000
Approved March 3, 1901 .....	50, 000
Approved June 28, 1902 .....	50, 000

Total ..... 250, 000

Total expenditures to June 30, 1903, \$109, 118. 23.

LIST OF CONTRACTS IN FORCE.

Contract for—	Name of contractor.	Date of approval.	Date of beginning.	Date of completion.
Constructing lock and abutment.	The Evansville Contract Company.	Oct. 20, 1900	Nov. 29, 1900	<sup>a</sup> Jan. 30, 1902
Constructing Chanoine dam.	do .....	Nov. 6, 1902	Dec. 10, 1902	(b)

<sup>a</sup> Time limit waived.

<sup>b</sup> 150 working days.

There is at present no navigation on this portion of the river.

REPORT OF MR. W. A. LELAND, ASSISTANT ENGINEER.

UNITED STATES ENGINEER OFFICE,  
Charleston, S. C., June 30, 1903.

CAPTAIN: I have the honor to submit the following annual report of work done on Congaree River from Gervais Street Bridge, Columbia, to Granby:  
*Lock and abutment.*—At the beginning of the fiscal year the Evansville Contract

## 1132 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

Company had completed the abutment except the paving, and had completed about half of the lock walls. During the past fiscal year work was carried on whenever the stage of the river permitted, except for a part of October and November, when a change of superintendents was made, and the entire contract was completed except the riprap work below the abutment and an extension of the upper guide crib.

The items of work done under this contract, with contract prices and totals of quantities, are given in the following table:

Kind of work and material.	Price per unit.	Done prior to July 1, 1902.		Done after July 1, 1902.	
		Quantities.	Cost.	Quantities.	Cost.
Earth excavation.....cubic yards..	\$0.44	5,049	\$2,221.56	2,340	\$1,029.60
Embankment.....do.....	.59	1,008	594.72	4,259	2,512.81
Rock excavation.....do.....	3.96	3,632	14,382.72	214	847.44
Timber in permanent construction...M B. M..	40.00	69,920	2,796.80	9,862	394.48
Sheathing.....do.....	35.00	2,030	71.05	2,830	99.05
Stone filling.....cubic yards..	1.58	837	1,322.46	213	336.54
Puddle.....do.....	2.96	102	301.92	168	497.28
Concrete.....do.....	7.00	2,128	14,896.00	3,128	21,896.00
Bolt holes in masonry.....linear feet..	.50	23	11.50	227	113.50
Miter sills.....M B. M..	90.00			1,764	158.76
Concrete paving.....cubic yards..	6.60			1,697	11,200.20
<b>Total .....</b>			<b>36,598.73</b>		<b>39,085.66</b>

*Chanoine wicket dam.*—Bids were opened September 3, 1902, for building 376 feet of Chanoine dam, and contract was entered into with The Evansville Contract Company, the lowest bidders, on October 2, 1902, and the contract was approved by the Chief of Engineers November 6, 1902. The contractors erected a tower on either side of the river and perfected a cable line with trolley running immediately over the foundation of the dam. The stone crusher was raised to level of the railroad supply track and concrete mixer and bins were changed to be within reach of trolley. A dredge was constructed for supplying sand for concrete and a small steamer was built for towing the sand lighters. About 100 feet of cofferdam was completed, extending from lock toward the abutment. This was washed away by freshet during first part of June, and about 75 feet had been rebuilt by the end of the same month.

*Work by hired labor.*—Lever arms to lock gates were completed and oak miter posts were fitted in place. Gates were moved to lock walls. Timber to be used as temporary coffer at upper and lower ends of lock was purchased and stored in warehouse. A pulsometer and boiler were purchased to free lock chamber of water. Gates were not mounted, as the contractors were preparing to build cofferdam for a portion of the Chanoine dam and lock chamber had to be kept open for the passage of water. Valves were set before the contractors finished the lock. The river was thoroughly sounded from the lock to Gervais Street Bridge and a proposed channel 150 feet wide located on map.

Respectfully submitted.

W. A. LELAND, *Assistant Engineer.*

Capt. G. P. HOWELL,  
*Corps of Engineers*

## O 6.

## IMPROVEMENT OF THE INLAND WATERWAYS BETWEEN CHARLESTON HARBOR, SOUTH CAROLINA, AND OPPOSITE McCLELLANVILLE.

No work was done during the year, as title to the lands required for the improvement must first be obtained.

A project for the expenditure of the appropriation will be submitted when the titles have been obtained.

*Money statement.*

July 1, 1902, balance unexpended.....	\$50,000.00
July 1, 1903, balance unexpended.....	50,000.00
<hr/>	
{ Amount (estimated) required for completion of existing project.....	75,290.00
{ Amount that can be profitably expended in fiscal year ending June 30,	
1905, in addition to the balance unexpended July 1, 1903.....	50,000.00
{ Submitted in compliance with requirements of sundry civil act of June	
4, 1897.	

## APPROPRIATIONS.

June 13, 1902 .....	\$50,000.00
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## REPORT AND ESTIMATE OF CAPT. J. C. SANFORD, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,  
*Charleston, S. C., March 18, 1902.*

GENERAL: I have the honor to submit the following estimates for improving the inland navigation between Charleston, S. C., and opposite McClellanville, the estimates being given for a depth of 6 feet at mean low water and for a depth of 4 feet at the same stage, the estimates being in each case based on the same unit prices and all calculations made in the same manner as in report of examination of 1899, within referred to:

## CHARLESTON TO MCCLELLANVILLE.

6 feet depth, 75 feet bottom width.....	\$206,910
4 feet depth, 75 feet bottom width.....	152,570
4 feet depth, 60 feet bottom width.....	125,290

In the above estimates the route followed by both the 6-foot and 4-foot channels is the same as estimated for in the report of examination of 1899, except that in the case of both depths the use of Bullyard Sound is contemplated instead of cutting through the marshes behind the sound, thus reducing the amount of dredging by about 150,000 cubic yards. The estimate for a 4-foot channel 60 feet wide at bottom is added for the reason that this is the width adopted for Wappoo cut, a part of the inland passage between Charleston and Savannah, and is believed to be sufficient for all the navigation that is in immediate prospect.

In all former estimates for improving this portion of the inland passage no provision was made for the purchase of land where cuts through marsh were contemplated, and no provision for such purchase is made in the estimates given above. \* \* \* These lands are practically valueless at present, and it is thought that an appropriation should be conditioned upon being able to secure the land needed free of cost to the United States.

\* \* \* \* \*

Very respectfully, your obedient servant,

J. C. SANFORD,  
*Captain of Engineers.*

Brig. Gen. G. L. GILLESPIE,  
*Chief of Engineers, U. S. A.*



## O 7.

## IMPROVEMENT OF HARBOR AT CHARLESTON, SOUTH CAROLINA.

No work was done on the jetties.

The seagoing suction dredge *Charleston* worked during the greater portion of the year. She removed 218,921 cubic yards of material from the outer shoal and 63,309 cubic yards from the inner shoal. The dredge *Cape Fear* worked only a few days in July and removed 5,921 cubic yards from the eastern channel, and 814 cubic yards from the inner shoal. The total quantity of material removed during the year was 288,965 cubic yards. Whenever weather permitted, the dredges worked on the outer bar. Work in the eastern channel was directed toward deepening and widening this channel along the lighted range. Work on the inner shoal, near the inner entrance to the jetty channel, has been done only when storms made it impossible to work on the outer bar.

The annual survey shows a least depth of 26 feet at mean low water throughout the entire improved channel. This depth now extends from the city wharves to the ocean. The mean rise of tide is 5.2 feet. At the date of the last annual report there was a distance of 3,000 feet on the outer bar where the depth was 24.2 feet. The project depth has been obtained, but not the required width of 600 feet. Between the jetties the width is generally 250 feet, being reduced to about 175 feet at two places where survey of the previous year shows a width of about 125 feet. On the eastern channel across the outer bar the width generally is 225 feet; at one place it is only about 50 feet. These results were obtained with a hydraulic dredge, which could remove about 1,500 cubic yards per working day. The new dredge will probably have a capacity of 4,000 cubic yards, and much better results will be obtained when it is at work assisting the *Charleston*.

Under the contract, approved January 15, 1901, with the Petersburg Iron Works Company for the construction of a large seagoing suction dredge, at a cost of \$144,300, the contract time for completion being November 24, 1901, the work has continued slowly. The dredge will probably begin work during the present calendar year.

In view of the beginning of work, under extensive plans, on the new naval station at Charleston, it is important that an entrance channel not less than 26 feet deep at mean low water and 600 feet wide, as contemplated by the project, should be speedily obtained. An estimate of \$100,000 is, therefore, submitted below.

Report of Assistant Engineer James P. Allen and two maps<sup>a</sup> showing the inner shoal and the outer shoal are transmitted herewith.

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<sup>a</sup> Not printed.

*Money statement.*

July 1, 1902, balance unexpended .....	\$202,742.33
Amount appropriated by sundry civil act approved March 3, 1903 .....	60,000.00
April 16, proceeds auction sales of Government property credited in Treasury of United States.....	85.00
	<hr/>
June 30, 1903, amount expended during fiscal year .....	262,827.33
	<hr/>
July 1, 1903, balance unexpended .....	197,761.04
July 1, 1903, outstanding liabilities .....	4,415.87
	<hr/>
July 1, 1903, balance available .....	193,345.17
	<hr/>
July 1, 1903, amount covered by uncompleted contracts.....	78,760.00
	<hr/>
(Amount (estimated) required for completion of existing project .....	98,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903 .....	100,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897.	

For this improvement the following appropriations have been made:

By act of Congress—		By act of Congress—	
Approved June 18, 1878..	\$200,000	Approved March 2, 1895..	\$500,000
Approved March 3, 1879..	200,000	Approved June 6, 1900...	220,000
Approved June 14, 1880..	170,000	Approved June 13, 1902..	45,000
Approved March 3, 1881..	175,000	Approved June 28, 1902..	50,000
Passed August 2, 1882....	300,000	Approved March 3, 1903..	60,000
Approved July 5, 1884....	250,000	April 16, proceeds auction sales	
Approved August 5, 1886..	187,500	of Government property	
Of August 11, 1888.....	350,000	credited in Treasury of	
Approved Sept. 19, 1890..	370,000	United States.....	85
Approved July 13, 1892..	225,000		
Approved March 3, 1893..	750,000	Total .....	4,502,585
Approved August 18, 1894..	450,000		

Total expenditures to June 30, 1903, \$4,304,823.96.

## LIST OF CONTRACTS IN FORCE (EMERGENCY CONTRACTS).

Contract for—	Name of contractor.	Date of contract.	Date of beginning.	Date of completion.
Berth for dredge, storage room, and handling coal.	Consumers' Coal Co..	Dec. 1, 1901	Dec. 1, 1901	Sept. 1, 1902.
Furnishing coal.....	.....do .....	Mar. 25, 1902	Mar. 26, 1902	Oct. 26, 1902.
Berth for dredge, storage room, and handling coal.	.....do .....	Aug. 26, 1902	Sept. 1, 1902	Mar. 1, 1903.
Furnishing coal.....	.....do .....	Oct. 25, 1902	Oct. 26, 1902	Mar. 26, 1903.
Building launch .....	E. O. Hall, jr .....	Feb. 2, 1903	Feb. 12, 1903	July 1, 1903. <sup>a</sup>
Berth for dredge, storage room, and handling coal.	Consumers' Coal Co..	Feb. 24, 1903	Feb. 26, 1903	Aug. 26, 1903.
Furnishing coal.....	.....do .....	Mar. 25, 1903	Mar. 26, 1903	Apr. 26, 1903.
Cargo coal .....	.....do .....	Mar. 28, 1903	Mar. 29, 1903	Apr. 8, 1903.

<sup>a</sup> Time limit for completion waived.

# 1136 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

## COMMERCIAL STATISTICS.

[Does not include trade between Charleston and other points in same collection district.]

*Arrivals and clearances of vessels and commerce at Charleston, S. C., from January 1 to December 31, 1902.*

	Coastwise.			Foreign ports.						Total.		
				American vessels.			Foreign vessels.					
	No.	Tons.	Crew.	No.	Tons.	Crew.	No.	Tons.	Crew.	No.	Tons.	Crew.
Arrived ...	a 443	1,025,910	22,952	18	9,698	423	141	132,930	3,089	602	1,168,538	25,414
Cleared ...	b 83	116,799	2,361	17	8,177	374	100	68,264	1,745	200	193,240	4,480

<sup>a</sup> Of these, 9 vessels, 15,133 tonnage, with crew numbering 220, were foreign.

<sup>b</sup> Of these, 50 vessels, 69,536 tonnage, with crew numbering 1,493, were foreign.

Value of exports .....	\$5,320,029
Value of imports .....	1,775,265
Duties collected .....	31,498

*Commerce through Charleston Harbor, ocean entrance, calendar year 1902.*

Articles.	Tons of 2,000 pounds.	Value.	Articles.	Tons of 2,000 pounds.	Value.
IMPORTS.			EXPORTS.		
Brimstone.....	545	\$13,080	Lumber.....	225,122	\$933,915
Muriate of potash.....	9,152	366,080	Phosphate rock.....	19,195	57,585
Kanit.....	41,568	353,328	Manipulated fertilizer.....	2,512	50,240
Nitrate of soda.....	11,235	483,135	Clay.....	27,092	212,022
Sulphate of potash.....	876	38,544	Cotton, upland.....	57,904	9,496,256
Sulphate of ammonia.....	900	43,200	Cotton, sea-island.....	2,132	1,087,320
Manure salt.....	7,417	96,421	Cotton goods.....	12,499	4,999,015
Pyrites.....	100,848	705,936	Cotton-factory sweepings and lint.....	4,295	343,600
Tankage (blood and garbage).....	3,296	73,474	Cotton-seed oil.....	4,625	466,555
Fish scrap.....	14,911	246,032	Cotton seed.....	1,427	22,090
Manipulated fertilizer.....	1,682	23,210	Cotton-seed meal.....	7,300	130,552
Cotton.....	1,185	203,037	Rice.....	966	67,620
Coal.....	63,415	326,960	Rosin.....	2,169	27,012
Salt.....	6,196	43,372	Turpentine.....	290	33,350
Rice.....	4,968	266,280	Miscellaneous.....	6,649	353,392
Jute.....	7,693	307,712	Total.....	374,077	18,280,524
Lubricating and refined oil, gasoline, and naphtha.....	5,973	194,130			
Fruit.....	20,291	561,962			
Cocoanuts.....	1,157	42,410			
Cement, lime, and plaster.....	25,841	263,580			
Cotton seed.....	989	17,802			
Miscellaneous.....	118,630	11,796,788			
Total.....	448,768	16,466,473			

These commercial statistics do not include a large part of the business of Charleston which is done by the railroads, nor do they include the commerce passing over the rivers which enter the harbor, nor over the inland routes to the North and South. The commerce to and from Charleston through Wappoo Cut alone amounted to 143,165 tons, valued at \$2,637,481, in the calendar year 1902.

The regular lines of steamships established between this and other ports comprise a total of 33 steamships, of which 18 have been added during the past fiscal year.

REPORT OF MR. JAMES P. ALLEN, ASSISTANT ENGINEER.

UNITED STATES ENGINEER OFFICE,  
Charleston, S. C., June 30, 1903.

CAPTAIN: I have the honor to submit the following annual report for Charleston Harbor, South Carolina:

The work during the year has been dredging under the project for obtaining a

channel of at least 26 feet depth and 600 feet width at mean low water. No work was done for the maintenance of any channel or channels. The dredges *Charleston* and *Cape Fear* were used for this work. The *Cape Fear* worked for only a few days in July and removed 5,921 cubic yards from the eastern channel and 814 cubic yards from the inner shoal. She left Charleston on July 10 for Fernandina, Fla. After repairing at Jacksonville, Fla., the *Charleston* resumed work at this harbor July 24 and continued during the year, with a few interruptions due to breakages, until June 17, 1903, when she was removed from the work for repairs.

On June 19, 1903, she left Charleston for Jacksonville, Fla., and was taken upon the marine railway there on the 23d. On June 30 she was still upon the railway, where her bins were being recalked and gates repaired. Two new stern bearings will be cast and one put on and other general repairing done. She removed during the year 218,921 cubic yards of material from the outer and 63,309 cubic yards from the inner shoal, making a total during the year of 282,230 cubic yards. As the *Cape Fear* removed 6,735 cubic yards, the total quantity removed during the year was 288,965 cubic yards; total from beginning of operations, 4,339,164 cubic yards. The amount taken out during the past year is about 5½ per cent of the total estimated yardage necessary to be removed in order to secure the required channel depth and width. For the earlier portion of the year the work on the outer shoal had reference to the removal of a lump between the original range of the eastern channel and the new lighted range, but for the greater part of the year it was confined to the new lighted range. Very considerable progress was made toward securing the proposed channel width and depth, as will be shown later in this report. Judged, however, by the percentage of the material removed, it would require nearly twenty years to complete the work with the dredge *Charleston*. The amount of material removed is somewhat larger this year than it has been for the several years preceding. This may be due to one or all of several causes, viz, a class of material which was rather more easily dredged, better management of the loading and dumping, or the use of a new form of drag for the *Charleston*.

A new sounding boat designed mainly for use at this harbor was authorized, and is now under construction at Mount Pleasant, Charleston Harbor, South Carolina. This boat is 40 feet long, 10 feet beam, and is provided with a "Standard" gasoline engine. She will be completed in July, is expected to develop a speed of at least 9 miles an hour, and is designed so as to be especially suited for the hydrographical surveys required in this harbor. A number of minor surveys of the localities where dredging work was in progress were made. March 9, 1903, a survey of the outer channel showed a central depth of not less than 25.9 feet, and May 4, a 26-foot channel was shown entirely through from Charleston to the ocean, with a least width of about 130 feet.

The annual survey, covering substantially the same ground as last year, was made between May 18 and July 1, and two charts taken therefrom are submitted herewith. One of these shows the inner and the other the outer shoal. The intermediate portion of the jetty channel has not changed materially since the annual survey of 1902. A central depth of at least 26 feet at mean low water is shown entirely through, and a good channel not less than 25 feet deep and 250 feet wide. The old entrance channel has shoaled, so that the navigable depth is now less than 18 feet at mean low water. There are three quite narrow places in the main jetty channel. The first is at the point near the inner end where the channel changes direction from the Fort Sumter range to the Mount Pleasant Range. The second is on the old Fort Sumter range near the ends of the jetties, and the third is in the eastern channel near its outer end. Attention was called last year to the fact that the north shoal, just inside of the jetties, was encroaching upon the main channel. This process is continued, forming the second narrow place alluded to, and, furthermore, there has been an outward movement of this narrow place similar to that reported last year. The general movements of shoals are like those reported for previous years. The most noteworthy feature is the continuance of the crest of the north shoal just within the jetty ends in practically the same position for the last two years. This is noteworthy as at least an apparent exception to the general rule of the movement of these shoals. The areas of the outer shoals have not decreased as heretofore. The discontinuance of dredging along the edges of these shoals probably explains this.

Respectfully submitted.

JAMES P. ALLEN, *Assistant Engineer.*

Capt. G. P. HOWELL,  
*Corps of Engineers.*

## O 8.

## IMPROVEMENT OF WAPPOO CUT, SOUTH CAROLINA.

The work during the year was a survey of the improved portions of the cut.

It is proposed to expend the balance on hand in widening and deepening the cut across the Ashley River bar to the project width and depth of 200 and 7 feet, respectively, and in maintaining the project width and depth in the other portions of the channel.

*Money statement.*

July 1, 1902, balance unexpended .....	\$8,000.00
June 30, 1903, amount expended during fiscal year .....	128.56
July 1, 1903, balance unexpended .....	7,871.44
Amount (estimated) required for completion of existing project.....	17,500.00

For this improvement the following appropriations have been made:

By act of Congress—		By act of Congress—	
Approved March 3, 1881 ...	\$10,000	Approved July 13, 1892....	\$10,000
Passed August 2, 1882 .....	10,000	Of August 18, 1894 .....	7,000
Approved July 5, 1884 .....	3,000	Passed June 3, 1896 .....	2,500
Approved August 5, 1886 ..	5,000	Approved June 13, 1902 ...	8,000
Of August 11, 1888 .....	5,000		
Approved September 19, 1890	10,000	Total .....	70,500

Total expenditures, including June 30, 1903, \$62,628.56.

## COMMERCIAL STATISTICS, 1902.

Articles.	Tons of 2,000 pounds.	Value.	Articles.	Tons of 2,000 pounds.	Value.
Rice .....	8,280	\$414,000	Manipulated fertilizers .....	4,800	\$96,000
Vegetables .....	8,330	874,800	Gravel and shell .....	18,050	14,800
Cotton .....	1,420	700,281	Miscellaneous .....	12,350	789,000
Cotton seed .....	688	12,384			
Lumber .....	63,680	159,515	Total .....	143,165	2,637,481
Phosphate rock .....	25,567	76,701			

## O 9.

IMPROVEMENT OF INLAND WATERWAY BETWEEN CHARLESTON AND  
BEAUFORT, SOUTH CAROLINA.

No work has been done during the year.

It is proposed to expend the appropriation in beginning the construction of a canal across Fenwick Island.

*Money statement.*

July 1, 1902, balance unexpended .....	\$30,000.00
June 30, 1903, amount expended during fiscal year .....	7.40
July 1, 1903, balance unexpended .....	<u>29,992.60</u>
{ Amount (estimated) required for completion of existing project .....	31,600.00
{ Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903 .....	20,000.00
{ Submitted in compliance with requirements of sundry civil act of June 4, 1897.	

## APPROPRIATION.

June 13, 1902 .....	\$30,000.00
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## O 10.

## IMPROVEMENT OF BEAUFORT RIVER, SOUTH CAROLINA.

No work has been done, the only expenditures, \$19.58, being in connection with collection of commercial statistics and for traveling expenses.

It is proposed to expend the available balance in making a survey to determine condition of the channel and in restoring the width and depth, so far as funds will permit, where deterioration has occurred.

*Money statement.*

July 1, 1902, balance unexpended .....	\$2,407.25
June 30, 1903, amount expended during fiscal year .....	19.58
July 1, 1903, balance unexpended .....	<u>2,387.67</u>
{ Amount (estimated) required for completion of existing project .....	9,000.00
{ Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903:	
For works of improvement .....	\$9,000.00
For maintenance of improvement .....	2,000.00
{ Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	<u>11,000.00</u>

For this improvement the following appropriations have been made:

By act of Congress—	
Approved September 19, 1890 .....	\$12,500.00
Approved July 13, 1892 .....	12,500.00
Of August 18, 1894 .....	5,000.00
Passed June 3, 1896 .....	1,000.00
Approved June 13, 1902 .....	<u>2,000.00</u>
Total .....	33,000.00

Total expenditures to and including June 30, 1903, \$30,612.33.

# 1140 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

## COMMERCIAL STATISTICS, 1902.

Articles.	Tons.	Value.
Phosphate rock .....	60,583	\$155,332
Cotton, cotton seed, and miscellaneous merchandise .....	4,585	393,215
Lumber .....	400	2,050
Oysters (canned) .....	150	21,000
Total .....	65,668	571,597

*Number and class of vessels that have navigated that portion of Beaufort River known as Brickyard Creek during the year 1902.*

Kind.	Number.	Total tonnage.	Total value.	Number single trips.	Remarks.
Tugboats .....	6	260	\$40,000	1,500	Loaded one way only.
Lighters .....	20	2,000	10,000	1,200	
Yachts (steam) .....	30	4,500	1,000,000	160	
Schooners .....	6	2,400	60,000	6	
Buoy tender .....	1	500	40,000	4	
Revenue cutters .....	2	500	100,000	10	Carrying 2,500 passengers.
Torpedo boats .....	7	.....	.....	7	
Sloops .....	15	500	2,000	200	
Dredges .....	4	400	150,000	8	
Passenger boats .....	2	600	20,000	104	
Pilot boats .....	2	95	7,000	30	

## O II.

### REMOVING SUNKEN VESSELS OR CRAFT OBSTRUCTING OR ENDANGERING NAVIGATION, INDEFINITE.

Nothing was done during the year. There are a few sunken logs in the inland passage between Charleston and Beaufort, S. C., which have not seriously interfered with navigation. As some work is contemplated in the vicinity these will be removed at the first favorable opportunity.

An allotment of \$2,000 was made for removing the wreck of an old vessel which had been converted into a phosphate barge, and which lies in Ashley River, near Lambs, S. C. Bids for the removal of this wreck were excessive and were rejected. The wreck will be removed by hired labor and the use of the Government plant.

## APPENDIX P.

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IMPROVEMENT OF RIVERS AND HARBORS IN EASTERN GEORGIA; OF  
INSIDE WATER ROUTE BETWEEN SAVANNAH, GEORGIA, AND FER-  
NANDINA, FLORIDA, AND OF CUMBERLAND SOUND, GEORGIA AND  
FLORIDA.

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REPORT OF LIEUT. COL. JAMES B. QUINN, CORPS OF ENGINEERS,  
OFFICER IN CHARGE, FOR THE FISCAL YEAR ENDING JUNE 30, 1903,  
WITH OTHER DOCUMENTS RELATING TO THE WORKS.

### IMPROVEMENTS.

- |   |   |
|---|---|
| 1. Savannah Harbor, Georgia.                | 7. Ocmulgee River, Georgia.   |
| 2. Savannah River, below Augusta, Georgia.  | 8. Brunswick Harbor, Georgia.   |
| 3. Savannah River, above Augusta, Georgia.  | 9. Inside water route between Savannah, Georgia, and Fernandina, Florida.   |
| 4. Harbor at Darien and Doboy Bar, Georgia. | 10. Cumberland Sound, Georgia and Florida.                                  |
| 5. Altamaha River, Georgia.                 | 11. Removing sunken vessels or craft obstructing or endangering navigation. |
| 6. Oconee River, Georgia.                   |   |
- 

UNITED STATES ENGINEER OFFICE,  
*Savannah, Ga., July 17, 1903.*

GENERAL: I have the honor to transmit herewith my annual report for the fiscal year ending June 30, 1903, upon the works of the river and harbor improvements in my charge.

Very respectfully,

JAMES B. QUINN,  
*Lieut. Col., Corps of Engineers.*

Brig. Gen. G. L. GILLESPIE,  
*Chief of Engineers, U. S. A.*

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### P 1.

#### IMPROVEMENT OF SAVANNAH HARBOR, GEORGIA.

##### OPERATIONS DURING THE FISCAL YEAR ENDING JUNE 30, 1903.

There were dredged, under contracts, for maintenance of the 26-foot channel, 241,238.2 cubic yards of material. The Government dredge *Cape Fear* removed 7,377 cubic yards from Tybee Knoll.



Contracts were entered into for dredging a channel 28 feet deep at mean high water from the old waterworks, above Savannah, to the ocean. This does not include dredging on Tybee Knoll and on the outer bar, which is to be done by Government seagoing dredge. Under these contracts there were dredged, for the 28-foot project, up to June 30, 1903, a total of 1,048,613.9 cubic yards of material.

A contract was made for the construction of two mooring dolphins. Only one of these has been begun—that at the Bight, which is practically completed.

The Mackay Point training wall was repaired and extended, and four self-registering tide gauges were established.

For a history of the work and a detailed statement of operations during the past fiscal year, see report of Mr. A. S. Cooper, assistant engineer, herewith.

#### COMMERCE AND NAVIGATION.

Full discussions of the commerce of Savannah were given in the reports of the Chief of Engineers for 1890, pages 1252 and 1253, and for 1897, page 1497.

The regular lines of steamships established between this port and New York, Boston, Baltimore, and Philadelphia comprise a total of 14 steamers, of which 7 run to the first-named port, making an occasional trip to Boston, and 7 to the last-named two. During the calendar year 1902 they made 448 round trips and carried 883,597 tons of freight. Two steamships have recently been added to the line between Savannah and New York.

On the inland waters there are a number of small steamers plying between Savannah and adjacent ports, besides numerous schooners and small sailboats. It is estimated that for the year 1902 this portion of the commerce amounted to 180,000 tons, valued at \$1,800,000.

The chief articles of export are cotton, lumber, and naval stores, of which the shipments for the year 1902 were as follows: Of cotton, 1,140,177 bales; of lumber, 187,813,700 feet; and of naval stores, 296,430 barrels of turpentine, and 975,028 barrels of rosin.

The total tonnage of the port, inward and outward bound, coastwise and local, during 1902, was 3,232,909 tons, valued at \$175,271,911, the gain in tonnage over the previous year being 389,648 tons.

The shoaling at Tybee Knoll causes the available depth to the sea to suffer a loss. The improvement so far completed has, however, progressed in a satisfactory manner; the depth between the city and Tybee Knoll has been maintained without serious reduction, and the indications are that the wide channel being dredged out will maintain itself by the natural scour with slight assistance by dredging. It is believed that the new seagoing dredge shortly to be built for this improvement will be able to dispose of the accretions in the portion of the channel between the ends of the jetties and the sea.

The controlling depth on June 30, 1903, was 17.5 feet, at mean low water, on Tybee Knoll. The mean rise of the tide at this point is 6.8 feet. At every other point in the harbor there was an available depth of 19.5 feet at mean low water.

*Money statement.*

July 1, 1902, balance unexpended .....	\$436, 867. 63
Amount received from proceeds of Government property .....	75. 00
Amount appropriated by sundry civil act approved March 3, 1903 .....	720, 000. 00
	<hr/>
June 30, 1903, amount expended during fiscal year .....	1, 156, 942. 63
	202, 067. 95
	<hr/>
July 1, 1903, balance unexpended .....	954, 874. 68
July 1, 1903, outstanding liabilities .....	80, 184. 71
	<hr/>
July 1, 1903, balance available .....	874, 689. 97
	<hr/>
July 1, 1903, amount covered by uncompleted contracts.....	892, 933. 15
	<hr/>
{ Amount (estimated) required for completion of existing project .....	280, 000. 00
{ Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903:	
For works of improvement .....	\$280, 000. 00
For maintenance of improvement.....	100, 000. 00
	<hr/>
	380, 000. 00
{ Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

## AMOUNT AND DATE OF ALL APPROPRIATIONS.

From 1826 up to the date of the 22-foot plan of improvement appropriations amounting to \$667,096.64 were made for the improvement of the harbor and for the removal of wrecks, as follows:

By act of Congress of—		By act of Congress of—	
March 18, 1826.....	\$50, 000. 00	August 30, 1852 .....	\$40, 000. 00
March 3, 1829.....	24, 490. 00	March 3, 1855 .....	161, 000. 00
July 3, 1832.....	25, 000. 00	June 10, 1872 .....	50, 000. 00
March 2, 1833.....	43. 06	March 3, 1873.....	50, 000. 00
March 2, 1833.....	8, 430. 62	February 27, 1874 .....	193, 132. 96
June 28, 1834 .....	30, 000. 00		
March 3, 1835.....	20, 000. 00	Total .....	667, 096. 64
July 7, 1838.....	15, 000. 00		

Under the 22-foot plan of improvement the following appropriations were made:

By act of Congress of—	
June 23, 1874 .....	\$50, 000. 00
March 3, 1875.....	70, 000. 00
August 14, 1876 .....	62, 000. 00
June 18, 1878.....	70, 000. 00
March 1, 1879.....	100, 000. 00
June 14, 1880.....	65, 000. 00
March 3, 1881.....	65, 000. 00
August 2, 1882 .....	200, 000. 00
July 5, 1884.....	200, 000. 00
August 5, 1886 .....	150, 000. 00
August 11, 1888 .....	180, 000. 00
	<hr/>
	1, 212, 000. 00
Unexpended balance of last appropriation carried to new project.....	4, 035. 05
	<hr/>
Total .....	1, 207, 964. 95

# 1144 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY

Under the 26-foot plan of improvement the following appropriations have been made:

By act of Congress of—	
August 11, 1888 (unexpended balance) .....	\$4,035.05
September 19, 1890.....	350,000.00
July 13, 1892.....	318,750.00
March 3, 1893.....	1,000,000.00
August 18, 1894 .....	975,000.00
March 2, 1895.....	856,250.00
	<hr/>
	3,504,035.05
Amount deposited by clerk of United States circuit court for the southern district of Georgia, March 20, 1895.....	500.00
	<hr/>
	3,504,535.05
Unexpended balance of last appropriation carried to modified project .....	44,485.06
	<hr/>
Total.....	3 460,049.90

Under the modified 26-foot project for improving Savannah Harbor the following appropriations have been made:

By act of Congress of—	
March 2, 1895 (unexpended balance).....	\$44,485.06
June 3, 1896 .....	5,000.00
June 4, 1897 .....	350,000.00
July 1, 1898.....	450,000.00
March 3, 1899.....	\$200,000.00
	50,000.00
	<hr/>
	250,000.00
June 13, 1902 .....	50,000.00
	<hr/>
	1,149,485.06
Amount deposited to credit of the appropriation.....	301.41
	<hr/>
Total .....	1,149,786.47
Unexpended balance of last appropriations carried to new project .....	436,867.63
	<hr/>
Total.....	712,918.84

Under the 28-foot plan of improvement the following appropriations have been made:

By act of Congress of—	
June 13, 1902 (unexpended balance from last appropriation).....	\$436,867.63
March 3, 1903.....	720,000.00
	<hr/>
	1,156,867.63
Amount received from "Proceeds of Government property" November 12, 1902.....	75.00
	<hr/>
Total.....	1,156,942.63

Grand total, \$7,204,973.05.

## CONTRACTS IN FORCE.

Name and address of contractor.	Character of work.	Rate.	Date of approval.	Work begun.	Expires.
P. Sanford Ross, Incorporated, Jersey City, N. J.	Dredging ...	<i>Cents.</i> 14.9	Nov. 2, 1901	Dec. 16, 1901	Aug. 11, 1902
Geo. T. Warner, Savannah, Ga.	do .....	16	Apr. 18, 1902	Apr. 27, 1902	Sept. 27, 1902
P. Sanford Ross, Incorporated, Jersey City, N. J.	do .....	17.5	Dec. 15, 1902	Jan. 6, 1903	Aug. 16, 1904
Atlantic, Gulf and Pacific Co., New York, N. Y.	do .....	16.9	Dec. 11, 1902	Feb. 15, 1903	Oct. 6, 1904

## CONTRACTS IN FORCE—continued.

Name and address of contractor.	Piling.		Pile-driving, linear foot.	Timber, M feet.	Brush bundles, cubic yard.	Iron, per pound.	Stone, cubic yard.				
	Common, linear foot.	Cluster, linear foot.									
D. Power & Co. Savannah, Ga. ....	\$0.05	\$0.07	\$0.09	\$30	\$0.51	\$0.04	\$2.25				
Name and address of contractor.	Character of work.			Date of approval.	Work begun.	Expires.					
D. Power & Co. Savannah, Ga.	Repairs to training wall.			Nov. 21, 1902	Jan. 20, 1903	Mar. 20, 1903					
Name and address of contractor.	Piling.						Iron, per pound.	Timber.		Carbo-lineum, per gal-lon.	
	60 feet.	55 feet.	50 feet.	45 feet.	40 feet.	35 feet.		Prime, per M feet.	Mer-chant-able, per M feet.		
Egan, Smith & Co., Jacksonville, Fla. ....	\$4.44	\$4.15	\$3.89	\$3.11	\$2.89	\$2.66	\$0.10	\$0.03½	\$30.36	\$27.19	\$1.34
Name and address of contractor.	Character of work.				Date of ap-proval.		Work begun.	Expires.			
Egan, Smith & Co., Jacksonville, Fla.	Construction of mooring dolphins.				Nov. 26, 1902		Dec. 10, 1902	May 10, 1903			

a Completed Sept. 12, 1902.

b Completed Sept. 17, 1902.

c Completed Feb. 28, 1903.

d Extended; no specific date fixed.

## COMMERCIAL STATISTICS.

Cotton statistics of the port of Savannah, Ga., for the commercial year ending August 31, 1902, are as follows:

*Receipts from all sources.*

Grade.	Quantity.	Weight.	Value.
	<i>Bales.</i>	<i>Pounds.</i>	
Upland.....	1, 103, 327	551, 078, 736	\$44, 088, 946
Sea-island.....	55, 336	21, 592, 107	4, 348, 302
Total.....	1, 158, 663	572, 670, 843	48, 437, 248

Destination.	Upland.	Sea-island.
	<i>Bales.</i>	<i>Bales.</i>
Coastwise.....	288, 108	34, 968
Great Britain.....	207, 399	12, 046
France.....	45, 746	2, 599
Other continental ports.....	548, 879	432
Mill consumption and burned.....	2, 257	.....
Reshipped to interior.....	191	1, 894
Total.....	1, 092, 580	51, 939

*Total exports.*

Grade.	Foreign ex-ports.	Coastwise exports.	Total.
	<i>Bales.</i>	<i>Bales.</i>	<i>Bales.</i>
Upland.....	802, 024	288, 108	1, 090, 132
Sea-island.....	15, 077	34, 968	50, 045
Total.....	817, 101	323, 076	1, 140, 177

## 1146 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

*Steamship lines.*

Line.	Steamers.	Voyages.	Freight.
			<i>Tons.</i>
Ocean Steamship Co.: Savannah to Boston .....			
Savannah to New York .....	7	188	503,860
Merchants and Miners' Transportation Co.: Savannah to Baltimore .....	4	156	218,458
Savannah to Philadelphia .....	3	104	161,279
Total .....	14	448	883,597

*Cotton receipts at Savannah, 1902.*

Number of bales..... 1,158,663

*Receipts of naval stores at the port of Savannah, season of 1902-3.*

Spirits of turpentine.....casks.. 292,496  
Rosin.....barrels.. 940,507

*Arrivals and clearances of vessels and commerce at Savannah, Ga., from January 1 to December 31, 1902.*

	Coastwise.			Foreign ports.						Total.			Great- est draft.
				American vessels.			Foreign vessels.						
	No.	Tons.	Crew.	No.	Tons.	Crew.	No.	Tons.	Crew.	No.	Tons.	Crew.	
Arrived.	580	1,059,081	22,265	7	3,929	52	172	197,792	3,126	759	1,260,603	25,443	Feet. 24.00
Cleared.	480	852,586	19,493	9	5,041	84	257	377,115	5,645	746	1,279,742	25,222	24.10

*Commerce (foreign).*

Value of exports.....\$47,708,951.00  
Value of imports.....768,695.00  
Duties collected.....48,893.72

## REPORT OF MR. A. S. COOPER, ASSISTANT ENGINEER.

SAVANNAH, GA., July 11, 1903.

SIR: I have the honor to submit the following report of work done on Savannah Harbor:

## WORK DONE PRIOR TO JUNE 30, 1902.

The first work of improvement on Savannah Harbor was done by an organized commission of pilots. Up to 1826 they had collected fees from the shipping to the amount of \$100,000. This was spent mainly in closing-dams. Between the years 1826 and 1856 the Government spent \$375,963.68, mainly in dredging, under the direction of the Treasury Department. In 1856 the city of Savannah assumed charge of the work and at the close of the season of 1871 had spent \$157,000 in dredging. In 1873 the Government again assumed charge of the harbor under the Engineer Department of the Army. With the exception of some work on Cross Tides dam and the removal of wrecks and obstructions, the work was confined to dredging up to 1880. Between the years 1876 and 1881, inclusive, the jetty work consisted of a submerged dam at the south channel, work on closing dams, and a partial construction of Cross Tides dam. During the first of the year 1882 the jetty work was done by purchase of material and hired labor, and at the close of this year there had been placed in the work the following amount of material (since 1876):

Log mattresses.....square yards.. 73,175  
Brush.....cubic yards.. 9,036  
Stone.....do.... 12,006

Beginning with January, 1883, the jetty work was all done by contract, and up to June 30, 1892, the following quantities of material had been used:

Mattresses .....	square yards..	440, 256
Stone .....	cubic yards..	109, 940
Brush .....	do.....	107, 735
Oyster shells .....	do.....	592
Pile training walls .....	linear feet..	12, 598
Clusters .....		44

This work completed the spur dams and started the training walls at the upper flats. A contract was let on October 22, 1892, for the completion of all training walls and jetties, which contract was completed in July, 1895. The following quantities of materials were placed under this contract:

Mattresses .....	square yards..	1, 435, 751
Brush .....	cubic yards..	263, 019
Stone .....	do.....	157, 347
Timber .....	feet B. M..	704, 972
Iron .....	pounds..	75, 556
Piles .....		14, 786

Between December, 1896, and October, 1897, the following amount of material was placed in the breakwater, Dam No. 31, and Cockspur Island training wall, viz: Mattresses, 264,958.2 square yards, and stone, 25,922.11 cubic yards.

The following table gives in detail the amount of all dredging done in Savannah Harbor by the Engineer Department since 1873:

TABLE A.—*Dredging in Savannah Harbor, Ga., 1873 to 1902.*

Year.	Above city.	Marsh Island channel.	City front.	Wrecks.	Obstructions.	Upper flats.	Lower flats.	Long Island crossing.	Oyster bed.	Tybee knoll.
1873				20,000		30,334				671
1874				2,436		57,688				55,369
1875			61,064	27,103		19,634				99,992
1876	9,850		9,995	189,348						18,349
1877	25,047			115,189					12,012	6,395
1878									2,948	9,656
1879	27,131									
1880	29,675		12,297	113,387	15,000					
1881	24,849		169,607	12,019	13,276	5,000	5,850		19,212	23,771
1882			24,289	37,153						33,047
1883			23,191	83,180	29,084					
1884			2,240	8,448		32,090	34,926			
1885			9,455	39,765		21,368			27,528	
1886			4,954	20,531	3,134	1,688	8,167			
1887		8,622	40,923	41,844		4,418				25,286
1889		35,494	23,302	79,998	9,656	6,723				32,497
1890		10,038	15,346			6,166				62,564
1891		60,000	26,324	191,861		55,397				35,506
1892			664							
1893			97,541	59,529	31,522		86,536		51,328	163,662
1894	166,770	426,866	62,050	63,682		51,576			68,319	141,833
1895		122,171	171,220	173,395	101,908	120,414	138,347	472,173		564,497
1896		262,975	223,604	195,264	76,635	111,529	144,744	566,873	73,745	472,695
1897		43,916	8,484	15,161		15,239		33,355		27,486
1898		108,434								
1899		174,581	28,812	64,607	68,928	13,377	20,775	66,775		
1900		78,000	50,846				12,971	205,963		
1901		219,933					99,813			
1902		52,170						146,210		91,833
Total	283,322	1,700,741	1,024,596	1,484,251	349,143	552,641	551,629	1,491,349	255,092	1,865,129

The dates of construction of the various jetties and training walls are as follows:

Cross Tides dam .....	1876-1885
Kings Island jetty .....	1857
Marsh Island closing dam .....	1894
Marsh Island training wall .....	1893
Garden Bank spur dams .....	1882
Garden Bank training wall .....	1895
Fig Island jetty .....	1882-1887
Barnwell Island closing dams .....	1881-1894

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Dam No. 15 (obstructions) .....	1882
Submerged dam at south channel .....	1881
Mackay Point training wall .....	1893
South Channel spur dams .....	1893
Barnwell Island training wall .....	1894
Duck Puddle closing dam .....	1892
Dams Nos. 4, 23, 25, 6, 27, and 10 (upper flats) .....	1883-1884
North Elba Island training wall .....	1891-1893
South Elba Island training wall .....	1891
Philbrick's Cut dam .....	1881-1883
Dams Nos. 13, 14, and 29 (lower flats) .....	1881-1884
Elba Island spur dams .....	1892
Jones Island spur dams .....	1892
Lower Flats training wall .....	1893
Venus Point training wall .....	1894
Big Gap dam .....	1881-1884
Dutch Gap dam .....	1881
Dams Nos. 26, 28, 33, and 35 (Long Island crossing) .....	1885
North Long Island training wall .....	1893-1894
Dam No. 31 .....	1885-1897
Oyster Bed training wall .....	1889-1890
Cockspur Island training wall .....	1894-1895
Breakwater .....	1897

## WORK DONE DURING THE FISCAL YEAR ENDING JUNE 30, 1903.

During the past fiscal year dredging has been done under five different contracts and agreements. Under contract with P. Sanford Ross, incorporated, made October 9, 1901, the following work was done at Long Island Crossing:

	Cubic yards.
July, 1902 .....	28, 805. 1
August, 1902 .....	26, 463. 5
September, 1902 .....	13, 187
<b>Total</b> .....	<b>68, 455. 6</b>

At Marsh Island channel the following amount was dredged under contract with George T. Warner, made March 24, 1902:

	Cubic yards.
August, 1902 .....	31, 171. 6
September, 1902 .....	25, 927. 2
<b>Total</b> .....	<b>57, 098. 8</b>

Logs removed, 20.

Under circular letter of June 25, 1902, P. Sanford Ross, incorporated, did the following work at the places designated:

City front:	Cubic yards.
September, 1902 .....	18, 666
October, 1902 .....	29, 993. 7
November, 1902 .....	16, 327. 4
<b>Total</b> .....	<b>64, 987. 1</b>

Wrecks channel, November, 1902 .....

3, 024

Upper flats:

November, 1902 .....	7, 161. 2
December, 1902 .....	37, 355. 2
January, 1903 .....	3, 156. 3

**Total** .....

47, 672. 7

The Government dredge *Cape Fear* in the month of August, 1902, removed from Tybee Knoll 7,377 cubic yards.

On November 21, 1902, a contract was entered into with the Atlantic, Gulf and Pacific Company to dredge about 3,310,000 cubic yards of material from the upper portion of the harbor and opposite the quarantine station. Up to the 30th of June, 1903, the following amount of work had been done under this contract:

Marsh Island channel:	Cubic yards.
March, 1903.....	48, 035
April, 1903.....	85, 065
May, 1903.....	50, 670
June, 1903.....	100, 160
Total.....	283, 930

City front:	
February, 1903.....	14, 176. 2
March, 1903.....	31, 169. 4
April, 1903.....	47, 627. 1
May, 1903.....	43, 575. 2
June, 1903.....	62, 057. 5
Total.....	198, 605. 4

Logs removed, 92.

Total for contract, 482,535.4 cubic yards.

On November 14, 1902, a contract was entered into with P. Sanford Ross (Incorporated), for dredging about 2,800,000 cubic yards of material between the head of Elba Island and Tybee knoll. The following amount of work had been done under this contract up to the close of the fiscal year:

Long Island crossing:	Cubic yards.
January, 1903.....	23, 981. 7
February, 1903.....	58, 553. 1
March, 1903.....	76, 112. 6
April, 1903.....	52, 366. 1
May, 1903.....	47, 645. 5
June, 1903.....	81, 986
Total.....	340, 645

Lower flats:	
April, 1903.....	4, 299
May, 1903.....	11, 585. 6
Total.....	15, 884. 6

Upper flats:	
January, 1903.....	10, 000
February, 1903.....	35, 000
March, 1903.....	35, 000
April, 1903.....	15, 000
May, 1903.....	22, 000
June, 1903.....	30, 000
Total.....	147, 000

Obstructions:	
April, 1903.....	8, 272
May, 1903.....	24, 295. 7
June, 1903.....	29, 981. 2
Total.....	62, 548. 9

Logs removed, 10.

Total for contract, 566,078.5 cubic yards.

The total amount dredged during the fiscal year under all contracts, and by the *Cape Fear*, was 1,297,229.1 cubic yards.

A contract was made with D. Power & Co. on November 21, 1902, for repairing and extending the Mackay Point training wall. Work was begun under this contract on January 20, 1903, and completed February 28, 1903. The total amount of material placed was as follows:

Piling:	
Common..... linear feet..	6, 023
Cluster..... do....	330
Pile driving..... do....	3, 445
Timber..... feet B. M..	11, 700
Brush..... cubic yards..	2, 600. 9
Stone..... do....	1, 443
Iron..... do....	1, 417. 9

Total amount paid contractors, \$5,615.81.



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On November 3, 1902, a contract was made with Egan, Smith & Co. to construct two large mooring docks—one at The Bight and one at Venus Point—designated in the contract as mooring dolphins. At the end of the fiscal year the following amount of work had been done on the one at The Bight, the one at Venus Point not yet having been started:

Piles furnished:	
60 feet long.....	101
55 feet long.....	55
50 feet long.....	58
45 feet long.....	55
40 feet long.....	94
35 feet long.....	233
Pile driving.....linear feet..	11,897.2
Timber:	
Prime inspection.....feet B. M..	66,204
Merchantable inspection.....do....	48,204
Iron.....pounds..	29,263.8
Carbolineum wood preserver.....gallons..	156

The total amount earned under this contractor to June 30, 1903, \$7,735.10.

## RESULTS ACCOMPLISHED.

As there has now been expended, for all purposes, on Savannah Harbor \$6,250,098.37, the question naturally arises as to what has been accomplished by the expenditure of so large a sum of money. To show this I have prepared two tables—one showing the controlling depths in the harbor since 1797, and another showing the movement of material before and after the jetties and training walls were constructed.

TABLE B.—Controlling depths, Savannah Harbor, Georgia.

[All depths refer to mean low-water plane.]

Year.	Marsh Island channel.	City front.	Wrecks.	Obstructions.	Upper flats.	Lower flats.	Long Island crossing.	Oyster bed.	Tybee knoll.	Bar.	Least depths city to sea.
1797.....		9	7.5								7.5
1816.....			6.5								6.5
1830.....			7.5								7.5
1835.....			8		10				10		8
1849.....		9.5	8.5								8.5
1853.....		8	7	7	10	9	13	14	10		7
1855.....		7	7	9	9	9	13	14	10	19.5	7
1865.....		11	9.5	9.5	9	10					9.5
1871.....		17	10.5	10.5							10.5
1873.....		12	12						9		9
1874.....	5	11	10	13							10
1875.....									11.2		11.2
1879.....			13.5								13.5
1881.....		13.1							13		13
1882.....		14.2	12.2		11.8	9.9					9.9
1883.....		13.8		{ 11 15.3 }							11
1884.....			11.1		11	12	12.8	13.4	12.3		11.1
1886.....				14.6	13.2	13.4	14.1		14.8		13.2
1887.....				14.4	14.1	13.4	13.7			18.7	13.4
1888.....	4.2	14.2	13.3						12.9		12.9
1889.....			15.4	15.7	14.3	14.7	15.2		13		13
1890.....	6.2	15.2	14.9	14.4	14.4	13.9	14.7	16.2	13.4		13.4
1891.....		15.9	16	16	16.2	15.2	17.1		13.8		13.8
1892.....		13.8	14.8	14.4	15.9	14.2	15		14.5		14.5
Feb., 1893.....		16.5	16.8								
June, 1893.....		16.6	14.7	17.4	17	17	16	16	14.4		14.4
1894.....	14	16	16.1	16.5	15.9	16.4	14.4	16.3	14.8		14.4
1395.....	13.1	18.1	17.9	18.3	19.6	19.9	17		18.2	19.8	17
Apr., 1896.....	16	20.4	20.1	20.9	21.1	21.3	19.2		19.8		19.2
Oct., 1896.....	18	20.6	20.2	20.2	20.6	21.2	20.4	20.5	20.5		20.2
1897.....	17.1	19.6	19.2	20.8	21.6	20	20		19.9		19.2
1898.....	14.2	18.7	19.7	19.2	19.2	18.4	17.5		18.7		17.5
1899.....	15.4	17.2	19.7	21.1	20	20.7	17.4		18.2		17.4
1900.....	16.2	20.3	20.5	20.3	20.4	19.6	18.7		18.3	20	18.3
1903 <sup>a</sup> .....		21	20.5	21	19.5	20	19.5		17.5		17.5

<sup>a</sup> No survey for this year; depths are approximate only.

TABLE C.—*Movement of material, Savannah Harbor, Georgia.*

Locality.	1882-1890.					
	Total scour or fill.		Moved by dredging.		Resultant scour or fill.	
	Cu. yds.		Cu. yds.		Cu. yds.	
Wrecks.....	— 340,000		273,666		— 66,334	
Upper flats.....	— 970,000		72,453		— 897,547	
Lower flats.....	— 710,000		43,093		— 666,907	
	1884-1890.					
Long Island crossing.....	—1,800,000				—1,800,000	
Locality.	1890-1894.			1894-1900.		
	Total scour or fill.	Moved by dredging.	Resultant scour or fill.	Total scour or fill.	Moved by dredging.	Resultant scour or fill.
	Cu. yds.	Cu. yds.	Cu. yds.	Cu. yds.	Cu. yds.	Cu. yds.
Above waterworks.....	— 78,000	126,860	+ 49,000	— 324,000	000	— 324,000
Marsh Island channel.....	— 200,000	256,543	+ 56,543	— 731,000	1,081,395	+ 350,395
City front.....	— 630,000	731,374	+ 101,374	— 734,000	686,926	— 47,074
Wrecks.....	— 200,000	256,543	+ 56,543	— 649,000	606,144	— 42,856
Five-fathom hole.....	— 100,000	000	— 100,000	— 126,000	000	— 126,000
Obstructions.....	+ 23,000	31,521	+ 54,521	— 426,000	269,144	— 156,856
Bight.....	+ 42,000	000	+ 42,000	+ 141,000	000	+ 141,000
Upper flats.....	— 285,000	106,993	— 178,027	— 367,000	237,948	— 129,057
Between flats.....	— 33,000	000	— 33,000	— 210,000	000	— 210,000
Lower flats.....	— 229,000	86,586	— 142,414	— 107,000	273,481	+ 166,481
Pocket at Venus Point.....	— 50,000	000	— 50,000	— 106,000	000	— 106,000
Long Island crossing.....	000	000	000	— 1,122,000	1,025,252	— 96,748
Red Light shoal.....	— 200,000	119,647	— 80,353	— 195,000	66,371	— 129,629
Tybee Knoll.....	— 175,000	200,000	+ 125,000	— 1,378,000	1,046,385	— 331,615
Tybee Roads.....				+ 412,000	000	+ 412,000
City to Tybee Roads.....			— 195,406			— 1,047,350
South channel to Tybee Roads.....						+ 1,138,000

NOTE.—+ indicates fill, and — indicates scour.

Up to 1881 all improvement of any consequence was by dredging, and it will be noticed that an increase of depth from 6½ feet to 13 feet was secured by that means alone. From this date the results are from a combination of dredging and scour induced by jetty construction, and the results accomplished by the jetties is better shown by the table on movement of material. At Wrecks channel it will be noticed that a scour of 66,334 cubic yards took place between 1882 and 1890; between 1890 and 1894 a fill of 55,543 cubic yards, and between 1894 and 1900 a scour of 38,118 cubic yards, showing that this jetty (Fig Island training wall) is only about sufficient to maintain the channel.

At obstructions, between 1890 and 1894, there was a fill of 54,521 cubic yards, and between 1894 and 1900 a scour of 156,856 cubic yards. This is due to the fact that Mackay Point training wall was built in the latter part of 1893, and had little effect on the first period, but produced good results on the last period. These figures also indicate that it was probably a serious mistake to build Dam No. 15 at all. (Built in 1882.)

At the upper flats, between 1882 and 1890, there was a scour of 897,547 cubic yards; between 1890 and 1894 a scour of 178,027 cubic yards; and between 1894 and 1900 a scour of 129,057 cubic yards. During the first period the spur dams only were built. The last two periods show the effect of the training walls.

At the lower flats these same three periods show a scour of 666,907 cubic yards, a scour of 142,464 cubic yards and a fill of 166,481 cubic yards. This fill is due to a bad shoal being moved down from the pocket above, as shown in the detailed table.

At Long Island crossing, between 1884 and 1890, there was a scour of 1,800,000 cubic yards; between 1890 and 1894 a balance, and between 1894 and 1900 a scour of 96,748 cubic yards. During the first period the spur dams only were in action, and both spur dams and training walls the balance of the time. In this case the spur dams alone increased the depth over the shoal from 12.8 feet to 17.1 feet, in six years, without any dredging.

At the Tybee Knoll channel, between the years 1890 and 1894, there was a fill of 125,000 cubic yards; and between 1894 and 1900 there was a scour of 331,615 cubic yards. During the first period the Oyster Bed training wall only was built, and

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during the second period both that wall and the Cockspur Island training wall were in full effect, showing that the north wall alone secured no beneficial results, whereas the addition of the south wall was a decided benefit.

In the north channel, between the years 1894 and 1900, there was a resultant scour, from the city to Tybee Roads, of 1,000,000 cubic yards, whereas in the south channel, where no jetties had been built, there had been a fill of about the same amount in the same time. Since the completion of the 26-foot project in 1896 it will be noticed that apparently considerable shoaling has taken place. This shoaling, however, is only in the former dredged cuts, and in all cases there has been a general scour over the entire area where this apparent shoaling is shown. This is probably due to the fact that the cuts heretofore have only been a very small part of the cross-sectional area at each place, and being considerably deeper than on the adjoining banks the velocities were so reduced in the bottom of these cuts that a fill has taken place in them, while at the same time a scour was taking place on the banks.

For these reasons the harbor has appeared to be deteriorating for the past four or five years; whereas, as a matter of fact, it has been improving materially by scour produced by the jetties. The new cuts now being made are much wider than ever before dredged, and it is believed that they will maintain themselves better than the old ones have done.

### RECOMMENDATION FOR FUTURE WORK.

With the funds available and to be appropriated for this harbor the existing contracts can be completed and the jetties repaired, leaving a balance on hand of about \$170,000. Taking out about \$70,000 for contingencies there is left but \$100,000, but as it is probable that the dredging called for by the project and provided for in the present contracts can be completed, after reducing the quantities 20 per cent, as provided for in the specifications, and also as not more than half of the amount estimated for jetty work will be needed, there will be sufficient funds to build and equip a seagoing dredge and operate it for one year, with all contingent expenses.

For annual maintenance, however, I would recommend that the following amounts be appropriated:

For dredging at Marsh Island channel.....	\$20,000
For dredging from the city to Tybee Knoll.....	20,000
For operating a seagoing dredge.....	50,000
For repairs to jetties.....	10,000

Contracts should be let as soon as practicable for repairs to existing jetties. About one-half of the amount provided in the existing project should be expended. Probably about 10,000 cubic yards of stone will be sufficient to do the work, no other material being needed at present. I would recommend that it be placed upon Cockspur Island training wall, at Tybee Knoll channel, on North Long Island training wall and Spur Dam No. 33, at Long Island crossing. If this work is not done soon the dredged cuts now being made and to be made at an early date will be in danger of shoaling up again.

Your attention is also invited to the shoal that has formed at Tybee Knoll, and it is recommended that the seagoing dredge for this harbor be completed as soon as possible in order that this shoal may be removed and the channel widened at this place. As the work in this portion of the channel is so far behind the other dredging, it is important that the sections should be opened up here in order to prevent deterioration of the cuts now being made above this point. Serious delays to the commerce of the port will surely follow if some means of removing this shoal are not secured this fall.

Very respectfully, your obedient servant,

A. S. COOPER, *Assistant Engineer.*

Lieut. Col. JAMES B. QUINN,  
*Corps of Engineers.*

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P 2.

### IMPROVEMENT OF SAVANNAH RIVER, GEORGIA.

At the close of the fiscal year the project depth can be carried from Savannah to Augusta, except at two or three places, where the con-

trolling depth at an ordinary stage of summer low water is 4 feet. In the upper 20 miles of the river the banks in many places cave more or less with every high freshet, and the problem of obtaining and maintaining the project depth is easily solved if the erosion of the banks can be stopped. The necessary training dikes for the contraction of the river at the wide reaches are, with two or three exceptions, constructed, and the shore protections recently built are, as far as they go, efficient in preventing the erosion of the banks. These shore protections do not have to be constructed to the top of the slope, but just high enough to prevent undermining the banks at an ordinary stage, so that at a high stage of water the falling in of the crest of the steep banks is prevented. The improvements are at present just at that stage where it is necessary to continue the work of revetting the banks and keeping in repair the numerous dikes.

As the total amount estimated in the project for the improvement of this stream has been appropriated, and as further training dikes and shore protections are absolutely necessary, a new project of improvement will be required to carry on the work.

It is estimated that for the completion of the project, as approved in 1890, there will be required the further sum of \$75,000 in addition to the amount required for maintenance.

It is further recommended that a survey of the river be made, with a view to providing a permanent system of improvement by locks and dams for the upper portion of the river, just below Augusta. It is estimated that this survey will cost \$5,000.

#### OPERATIONS DURING THE FISCAL YEAR ENDING JUNE 30, 1903.

The construction of training dikes and shore protection near Augusta was continued by Hunter & Frey under their contract until December 7, 1902. Work was carried on at Sand Bar ferry, Blue House bar, Tweedy's bar, Bugg's bar, and Kirk's bar. There were placed during the fiscal year under this contract 209,509 linear feet of piling, 51,985 feet B. M. of waling and cross-ties, 8,351 pounds of iron, 77,301.7 cubic yards of brush bundles (of which 6,208.6 cubic yards were woven into mattresses), 17,424.9 cubic yards of stone.

The continuation of this work was carried on between December 8, 1902, and January 24, 1903, by A. J. Twiggs, under open market purchase, at same prices as the preceding contract with Hunter & Frey. Work was carried on at Blue House bar and Tweedy's bar. There were placed in the work 20,367 linear feet of piling, 912 pounds of iron, 9,525.6 cubic yards of brush bundles, and 1,551.5 cubic yards of stone.

A contract was made with A. J. Twiggs on January 7, 1903, for continuing the work. At the close of the fiscal year the following material had been placed in dikes and shore protection at Tweedy's bar and Blue House bar under this contract, 16,170 linear feet of piling, 8,580 feet B. M. of waling and cross-ties, 2,470 pounds of iron, 14,683.31 cubic yards of brush (of which 2,057.4 cubic yards were woven into mattresses), 3,972.2 cubic yards of stone, and 436.6 cubic yards of bank grading.

The following works were constructed and repaired during the fiscal year:

*Kirk's bar.*—Dike repaired and refilled with brush for 3,600 feet.

*Sand Bar ferry.*—Dike extended 1,360 feet and 1,280 feet of old dike refilled.

*Blue House bar.*—Old dike refilled for 2,400 feet and 2,700 feet of new shore protection built.

*Tweedy's bar.*—New dike 500 feet long and 2,260 feet of new shore protection built.

*Bugg's bar.*—New dike 2,400 feet long and 600 feet of new shore protection built.

The new snag boat was completed November 26, 1902, and began snagging operations December 2, 1902. During the fiscal year the boat removed 1,176 snags and 65 stumps from the channel, cut 4,127 overhanging trees and saplings and 68 logs, and girdled 349 trees on the banks of the stream. On account of the burning of the snag boat *Tuccoa* in 1898, snagging operations have been much interrupted and the river at this time is full of snags.

#### COMMERCE AND NAVIGATION.

A detailed statement of the sources of the commerce of this river is given on page 1331 of the Annual Report of the Chief of Engineers for 1890, and on page 1504 of the same report for 1897.

During the calendar year 1902 there were four steamers engaged in the river traffic, making 156 round trips between Savannah and Augusta, and carrying 55,530 tons of freight, valued at \$3,353,585.

There were also received at Savannah from this river, in small boats and lighters, 148,134 bushels of rice, valued at \$148,134. The increase in tonnage over the year previous was 930 tons.

During the same year 24,972,900 feet B. M. of timber was rafted down the river, valued at about \$324,647.

#### *Money statement.*

July 1, 1902, balance unexpended .....	\$131, 446. 92
Amount received from proceeds of Government property, 1903 .....	50. 00
	<hr/>
	131, 496. 92
June 30, 1903, amount expended during fiscal year .....	99, 988. 43
	<hr/>
July 1, 1903, balance unexpended .....	31, 508. 49
July 1, 1903, outstanding liabilities .....	6, 385. 84
	<hr/>
July 1, 1903, balance available .....	25, 122. 65
	<hr/>
July 1, 1903, amount covered by uncompleted contracts .....	13, 483. 16
	<hr/>
{ Amount that can be profitably expended in fiscal year ending June 30, 1905, for maintenance of improvement, in addition to the balance unexpended July 1, 1903. ....	20, 000. 00
{ Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899. ....	

#### AMOUNT AND DATE OF ALL APPROPRIATIONS.

Under the original project for improvement of the Savannah River, adopted in 1880, the following appropriations were made:

By act of Congress of—

March 3, 1881 .....	\$15, 000. 00
August 2, 1882 .....	25, 000. 00
July 5, 1884 .....	15, 000. 00
August 5, 1886 .....	15, 000. 00
August 11, 1888 .....	21, 000. 00
	<hr/>
	91, 000. 00

Unexpended balance from last appropriation, carried to new project....	\$19.91
Total .....	90,980.09
Received from other appropriations for use of snag boat.....	2,500.00
Aggregate .....	93,480.09

Since the existing project for improving the Savannah River was adopted the following appropriations have been made for this work:

By act of Congress of—	
August 11, 1888 (balance unexpended) .....	\$19.91
September 19, 1890.....	25,000.00
July 13, 1892.....	35,000.00
August 18, 1894.....	15,000.00
June 3, 1896.....	15,000.00
March 3, 1899.....	20,000.00
June 6, 1900.....	64,000.00
March 3, 1901.....	100,000.00
June 28, 1902.....	86,000.00
Total.....	360,019.91
Amount received from "Proceeds of Government property," November 12, 1902 .....	50.00
	360,069.91
Grand total.....	453,550.00

## CONTRACTS IN FORCE.

Name and address of contractor.	Character of work.	Piling, linear foot.	Pile driving, linear foot.	Waling and cross-ties, per M feet.	Wire spikes, per pound.	Iron wire, per pound.
Hunter & Frey, Memphis, Tenn. <sup>a</sup>	Dike work .....	\$0.04½	\$0.08	\$24.00	\$0.06	\$0.05
A. J. Twiggs, Augusta, Ga.....	.....do.....	.04½	.08	24.00	.06	.05

Name and address of contractor.	Brush bundles, cubic yard.	Mattress weaving, cubic yard.	Stone, cubic yard.	Bank grading, cubic yard.	Date of approval.	Work begun.
Hunter & Frey, Memphis, Tenn. <sup>a</sup>	\$0.48	\$0.75	\$2.10	.....	July 10, 1901	Aug. 8, 1901
A. J. Twiggs, Augusta, Ga.....	.48	.75	2.10	\$0.15	Jan. 22, 1903	Jan. 26, 1903

<sup>a</sup> Completed Dec. 7, 1902.

## P 3.

## IMPROVEMENT OF SAVANNAH RIVER ABOVE AUGUSTA, GEORGIA.

The Savannah River above Augusta is navigable only by pole boats from the locks, 7 miles above the city of Augusta, to Petersburg, a distance of 48 miles.

So far as is known no deterioration of the channel has taken place during the past year. The channel is a difficult one and \$6,000 can be profitably expended in its improvement during the fiscal year ending June 30, 1905.

No work was done during the past fiscal year.

# 1156 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

## COMMERCE AND NAVIGATION.

A detailed statement of the commerce tributary to this river is given in a report on the examination and survey of the river, printed as House Executive Document No. 213, Fifty-first Congress, first session.

The freight carried on the river consists of cotton, grain, fertilizers, and general merchandise. In 1902 it amounted to about 2,940 tons, valued at \$196,997.

### *Money statement.*

July 1, 1902, balance unexpended .....	\$64.45
July 1, 1903, balance unexpended .....	64.45
	<hr/>
{ Amount (estimated) required for completion of existing project.....	13,000.00
{ Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903.....	6,000.00
{ Submitted in compliance with requirements of sundry civil act of June 4, 1897.	

### AMOUNT AND DATE OF ALL APPROPRIATIONS.

Under the original project of improvement of Savannah River above Augusta, adopted in 1879, the following appropriations were made:

By act of Congress of—

June 14, 1880 .....	\$16,000
March 3, 1881 .....	8,000
August 2, 1882. ....	15,000
	<hr/>
Total .....	39,000

Since the existing project for improving this portion of Savannah River was adopted the following appropriations have been made for this work:

By act of Congress of—

July 13, 1892.....	\$10,000
August 18, 1894 .....	6,000
June 3, 1896 .....	3,000
March 3, 1899 .....	1,000
	<hr/>
Total .....	20,000

### P 4.

## IMPROVEMENT OF HARBOR AT DARIEN AND DOBOY BAR, GEORGIA.

Darien Harbor is constituted by that portion of Darien River between the town of Darien and Doboy Sound. Doboy bar constitutes the nearest ocean entrance to Darien Harbor and the Altamaha River. These two works were consolidated by the act of Congress approved June 13, 1902.

### OPERATIONS DURING THE FISCAL YEAR ENDING JUNE 30, 1903.

A contract for dredging in Darien Harbor was made March 28, 1903, with George T. Warner, of Savannah, Ga. It is expected that work under this contract will be commenced about July 20.

No steps were taken toward the improvement of the channel across Doboy bar as it was deemed advisable to wait until a Government sea-

going dredge is available for this work. The nature of the work is such that it can not be done by contract at anything like a reasonable cost.

#### COMMERCE AND NAVIGATION.

The commerce of Darien consists almost entirely of timber. A small product of rice and naval stores is shipped from that point. A daily steamer runs to Brunswick. The bulk of the timber passing through Darien Harbor from the Altamaha River will probably cross Doboy bar when the improvement is complete. When the timber is gone, which is a matter of comparatively a few years, the commerce will probably greatly decrease.

In 1902 the commerce of Darien Harbor amounted to 174,528 tons, valued at \$1,092,561, an increase over the year previous of 55,694 tons.

#### *Money statement.*

July 1, 1902, balance unexpended .....	\$80,876.42
June 30, 1903, amount expended during fiscal year .....	57.33
July 1, 1903, balance unexpended .....	80,819.09
July 1, 1903, amount covered by uncompleted contracts .....	17,000.00
(Amount (estimated) required for completion of existing project .....	41,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903 .....	41,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897.	

#### AMOUNT AND DATE OF ALL APPROPRIATIONS.

Previous to the existing projects there were appropriated:

By act of Congress:	
Doboy bar, August 5, 1886 .....	\$5,795.40
Darien Harbor, June 18, 1878 .....	8,000.00
Total .....	13,795.40

Since the existing projects for improving these works were adopted the following appropriations have been made:

By act of Congress:	
Doboy bar, March 3, 1899 .....	\$70,000.00
Darien Harbor—	
September 19, 1890 .....	25,000.00
July 13, 1892 .....	25,000.00
August 18, 1894 .....	25,000.00
June 3, 1896 .....	20,000.00
March 3, 1899 .....	10,000.00
Darien Harbor and Doboy bar, June 13, 1902 .....	30,000.00
Total .....	205,000.00
Grand total .....	218,795.40

#### CONTRACT IN FORCE.

Contractor: George T. Warner, Savannah, Ga.  
 Character of work: Dredging.  
 Rate: 16½ cents per cubic yard.  
 Date of approval: April 16, 1903.  
 Work begun: Not yet started.  
 Expires: May 16, 1904.



# 1158 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

## COMMERCIAL STATISTICS.

*Arrivals and clearances of vessels at Darien, Ga., from January 1 to December 31, 1902.*

	Coastwise.			Foreign ports.						Total.			Great- est draft.
				American vessels.			Foreign vessels.						
	No.	Tons.	Crew.	No.	Tons.	Crew.	No.	Tons.	Crew.	No.	Tons.	Crew.	
Arrived.....	61	38,985	598	2	861	15	24	29,772	434	87	69,618	1,047	.....
Cleared.....	47	20,210	337	.....	.....	.....	34	42,719	674	81	62,929	1,011	.....

### *Timber shipments from port of Darien, Ga.*

Year.	Foreign.		Coastwise.		Total.	
	Superficial feet.	Value.	Superficial feet.	Value.	Superficial feet.	Value.
Jan. 1 to Dec. 31, 1902 .....	42,086,973	\$561,519	14,756,944	\$221,354	56,843,917	\$782,873

### *Commerce.*

Value of exports and imports .....	\$1,092,561.00
Total collections.....	1,864.28

P 5.

## IMPROVEMENT OF ALTAMAHA RIVER, GEORGIA.

This river is formed by the junction of the Oconee and Ocmulgee rivers. At a point some 25 miles from its mouth the river branches and the river traffic reaches the ocean by two routes—one by the north branch by way of Darien, and the other by the south branch to where it intercepts the inside waterway, which passage is taken to Brunswick.

The river is navigable from the Forks to Darien and to where it reaches the inside waterway. The lower section of the river is affected by the tides. The worst shoal is at Couper's bar, which at low water has only a foot of water, but by waiting on tides 4 to 5 feet can be had at this place. The controlling depth above the tidal range is 2 feet at summer low water. The river is subject to freshets and in the upper sections the freshet height at times goes 20 feet above the low summer stage. The lower section is bordered by low swamp lands and the freshets rise from 5 to 10 feet over the banks.

### OPERATIONS DURING THE FISCAL YEAR ENDING JUNE 30, 1903.

The training dike at Griner's bar was extended 300 feet and rock removed from the channel at Town Bluff shoals. A cut-off at Beard's Bluff was partially opened and the training dike at that point repaired. A cut-off was opened at Jack Williamssuck and the piling driven for a dike 300 feet long at Oglethorpe Bluff. Four thousand two hundred and ninety-six bundles of brush, 334 piles, and 218 cubic yards of stone were placed in the work. Three hundred and ninety-eight

snags and 15 stumps were removed from the channel and 1,629 overhanging trees and 551 logs cut on the banks of the stream.

Many of the old works of improvement require repairs, several rock shoals need to be removed, additional training dikes are required and numerous snags and overhanging trees should be removed. Thirty thousand dollars can profitably be expended during the fiscal year ending June 30, 1905.

#### COMMERCE AND NAVIGATION.

The principal items of commerce of the river are timber and naval stores and the merchandise necessary to supply the camps of the producers of those articles.

During the calendar year 1902, 102,540,980 feet B. M. of timber were rafted down the river, valued at about \$1,333,032. The majority of this timber came from the Oconee and Ocmulgee rivers and was rafted down the Altamaha to mills at Darien and vicinity. Thirty-nine million six hundred and ninety-seven thousand feet, valued at about \$516,061, originated on the Altamaha.

There were also handled about 8,867 tons of freight, valued at about \$620,690.

One steamer plies the river between Doctortown and the Forks, making two round trips per week, and another from Hollingsworth Ferry, on the Ocmulgee River, to Brunswick, making three round trips per month.

#### *Money statement.*

July 1, 1902, balance unexpended .....	\$10,218.31
June 30, 1903, amount expended during fiscal year.....	6,066.39
July 1, 1903, balance unexpended .....	4,151.92
July 1, 1903, outstanding liabilities .....	54.30
July 1, 1903, balance available .....	4,097.92
(Amount (estimated) required for completion of existing project .....	102,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903:	
For works of improvement.....	\$30,000.00
For maintenance of improvement .....	8,000.00
	38,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

#### AMOUNT AND DATE OF ALL APPROPRIATIONS.

Under the original project of improvement of the Altamaha River, adopted in 1880, the following appropriations were made:

By act of Congress of—	
March 3, 1881.....	\$5,000.00
August 2, 1882 .....	15,000.00
July 5, 1884.....	20,000.00
August 5, 1886 .....	20,000.00
August 11, 1888 .....	10,000.00
	70,000.00
Unexpended balance of last appropriation carried to new project .....	223.41
Total .....	69,776.59

Since the existing project for improving Altamaha River was adopted in 1890 the following appropriations have been made for this work:

By act of Congress of—	
August 11, 1888 (unexpended balance) .....	\$223. 41
September 19, 1890.....	15,000. 00
July 13, 1892.....	15,000. 00
August 18, 1894.....	10,000. 00
June 3, 1896.....	10,000. 00
March 3, 1899.....	6,000. 00
June 6, 1900 (allotted from emergency appropriation) .....	9,000. 00
June 13, 1902.....	10,000. 00
<hr/>	
Total.....	75,223. 41
<hr/>	
Grand total.....	145,000. 00

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## P 6.

### IMPROVEMENT OF OCONEE RIVER, GEORGIA.

This river is tributary to the Altamaha River and the present head of navigation is Milledgeville.

The controlling depth, at summer low water, is about 2 feet. The river is subject to high waters, which sometimes rise at Milledgeville to 30 feet above the low-water stage.

#### OPERATIONS DURING THE FISCAL YEAR ENDING JUNE 30, 1903.

Work done during the fiscal year was confined to snagging operations. There were removed 3,917 snags and 115 stumps from the channel; 3,468 overhanging trees and saplings and 41 logs were cut on the banks and 5 trees on banks girdled.

Rock ledges above Dublin and long sand shoals below Milledgeville require removal and the channel needs improvement at several places between Dublin and the Forks. It is estimated that \$30,000 can be profitably expended for works of improvement during the fiscal year ending June 30, 1905.

#### COMMERCE AND NAVIGATION.

The Oconee River is navigable from the mouth to Milledgeville. During the year 1902 the steamers plying the river in the vicinity of Dublin handled 7,781 tons of freight, valued at \$622,480. In addition to this there were rafted down the river during the same year 28,704,000 feet B. M. of timber, valued at about \$373,152. Excepting the timber traffic, the commerce of the river is carried on in detached segments tributary to the railroads crossing the river.

*Money statement.*

July 1, 1902, balance unexpended .....	\$25,093.27
June 30, 1903, amount expended during fiscal year .....	7,129.44
July 1, 1903, balance unexpended .....	17,963.83
July 1, 1903, outstanding liabilities .....	1,417.67
July 1, 1903, balance available .....	16,546.16
(Amount (estimated) required for completion of existing project .....	114,900.00
Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903:	
For works of improvement .....	\$30,000.00
For maintenance of improvement .....	8,000.00
	38,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

## AMOUNT AND DATE OF ALL APPROPRIATIONS.

Since the works of improvement were begun the following appropriations have been made:

By act of Congress of—	
June 18, 1878 .....	\$10,000.00
March 3, 1879 .....	1,500.00
June 14, 1880 .....	1,500.00
March 3, 1881 .....	2,500.00
August 2, 1882 .....	5,000.00
July 5, 1884 .....	3,000.00
August 5, 1886 .....	9,000.00
August 11, 1888 .....	12,500.00
Total .....	45,000.00
Unexpended balance from last appropriation carried to new project .....	177.82
Total .....	44,822.18

Since the existing project for improving the Oconee River was adopted the following appropriations have been made for this work:

By act of Congress of—	
August 11, 1888 (unexpended balance) .....	\$177.82
September 19, 1890 .....	25,000.00
July 13, 1892 .....	25,000.00
August 18, 1894 .....	10,000.00
June 3, 1896 .....	10,000.00
March 3, 1899 .....	10,000.00
June 6, 1900 (allotted from emergency appropriation) .....	3,750.00
June 13, 1902 .....	25,000.00
Total .....	108,927.82
Grand total .....	157,750.00

## P 7.

## IMPROVEMENT OF OCMULGEE RIVER, GEORGIA.

The head of navigation on this river is Macon, but the river during recent years has not been navigable above Hawkinsville, except at high water, owing to heavy rock shoals just above Hawkinsville and long sand shoals below Macon. Between these two obstructions the river has ample depth, but is more or less obstructed with snags and logs. Between Hawkinsville and the Forks the river is, with few exceptions,

in good condition, and while certain rock shoals are difficult to navigate, the controlling depth is nearly, if not quite, the project depth.

The difficulty in maintaining the depth at the upper end of the river at Macon is in preventing erosion of the banks, and to overcome this much more revetting of the banks will have to be done than was estimated for in the existing project.

The controlling depth between the Forks and Hawkinsville is 3 feet, though several places are navigable with difficulty at this stage. Between Hawkinsville and Macon 2 feet is all that can be carried at present at a low summer stage.

Owing to freshets, unforeseen changes in the channel, and damages to the dikes and dams and regulating constructions, it will be necessary to provide further funds to complete the improvement as originally planned, which improvement should be continued until the benefits desired are realized. To accomplish this the sum of \$75,000 should be appropriated for prosecution of the work, and the further sum of \$5,000 annually for maintenance.

#### OPERATIONS DURING THE FISCAL YEAR ENDING JUNE 30, 1903.

At Buzzards' bar 1,100 feet of training dike were built; at Mansfield's bar 600 feet of shore protection was rebuilt; at Macon bar 1,050 feet of Dike No. 4 was rebuilt; 1,470 feet were added to shore protection Dike No. 3, and 400 feet of spur dikes built back of Dike No. 3; 250 feet of shore protection built above Dike No. 2, and 1,300 feet of Dike No. 2 rebuilt.

The training dikes at Davis's reach and Mobley's Bluff were repaired, rock removed from Town shoals at Hawkinsville, and cut-offs opened at House Creek suck and Cow Face bar.

There were placed in the dike work at Macon 2,727 piling, 47,300 bundles of brush, and 1,309 cubic yards of stone, and at Davis's reach and Hollingsworth ferry and Mobley's Bluff 6,086 bundles of brush and 322 cubic yards of stone.

In opening up the cut-offs at Cow Face bar and House Creek suck 424 snags, 169 stumps, and 9,235 cubic yards of earth were removed.

The snag boat *Satilla* removed 2,140 snags and 414 stumps from the channel; removed two small wrecks and two old bridge piers; cut 7,017 overhanging trees and saplings and 107 logs on the banks of the stream.

As an experiment some 5,000 small willow shoots were planted on the banks at Macon in an effort to prevent erosion, but a destructive freshet washed them out before they had obtained a good hold in the soil.

With the exception of a portion of the cabin, the combined hoister and pile-driver *Sapelo* was rebuilt. This plant can use a Heyward bucket or act as a pile-driver.

#### COMMERCE AND NAVIGATION.

A detailed discussion of this subject will be found on pages 1478 to 1484 of the Report of the Chief of Engineers for 1890, and page 1520 of the same report for 1897.

At present there is no navigation at all between Macon and Hawkinsville, except that one small steamer occasionally goes to Macon.

Three steamers are engaged in the river traffic, running as follows: One between Hawkinsville and Wilcox Lake, making two round trips per week; one between Lumber City and Wilcox Lake, making two

round trips per week, and one between Hollingsworth Ferry and Brunswick, making three round trips per month.

During the calendar year 1902 there were handled by these boats 8,937 tons of freight, valued at about \$625,590. There were also rafted down the river 34,139,980 feet B. M. of timber, valued at about \$443,820.

*Money statement.*

July 1, 1902, balance unexpended .....	\$56,010. 73
Received on account of proceeds of Government property .....	106. 00
	<hr/>
June 30, 1903, amount expended during fiscal year .....	56,116. 73
	42,978. 77
	<hr/>
July 1, 1903, balance unexpended .....	13,137. 96
July 1, 1903, outstanding liabilities .....	2,700. 16
	<hr/>
July 1, 1903, balance available .....	10,437. 80
	<hr/>
{ Amount that can be profitably expended in fiscal year ending June 30, 1905, for maintenance of improvement, in addition to the balance unexpended July 1, 1903 .....	
{ Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899. ....	
	16,000. 00

AMOUNT AND DATE OF ALL APPROPRIATIONS.

Upon the original project of improvement of the Ocmulgee River, adopted in 1876, the following appropriations were made:

By act of Congress of—	
August 14, 1876 .....	\$15,000. 00
June 18, 1878 .....	15,000. 00
March 3, 1879 .....	7,000. 00
June 14, 1880 .....	7,000. 00
March 3, 1881 .....	5,000. 00
August 2, 1882 .....	5,000. 00
July 5, 1884 .....	3,000. 00
August 5, 1886 .....	7,500. 00
August 11, 1888 .....	15,000. 00
	<hr/>
Total .....	79,500. 00
Unexpended balance carried forward from last appropriation to new project .....	109. 27
	<hr/>
Total .....	79,390. 73

Since the existing project for improving Ocmulgee River was adopted the following appropriations have been made for the work:

By act of Congress of—	
August 11, 1888 (unexpended balance) .....	\$109. 27
September 19, 1890 .....	30,000. 00
July 13, 1892 .....	25,000. 00
August 18, 1894 .....	10,000. 00
June 3, 1896 .....	10,000. 00
March 3, 1899 .....	20,000. 00
June 6, 1900 .....	40,000. 00
March 3, 1901 .....	40,000. 00
June 28, 1902 .....	56,000. 00
	<hr/>
Total .....	231,109. 27
	<hr/>
Total, all appropriations .....	310,500. 00
Amount received from proceeds of Government property November 12, 1902 .....	106. 00
	<hr/>
Grand total .....	310,606. 00

## P 8.

## IMPROVEMENT OF BRUNSWICK HARBOR, GEORGIA.

Appropriations for this improvement under the Engineer Department have heretofore been made for the removal of a shoal in East River opposite the lower part of the city. The act of Congress approved June 13, 1902, provided also for the improvement of the bar, which work had theretofore been carried on by direct contract between Congress and a private individual. \* \* \* It also provided for dredging in Academy Creek to an amount not to exceed \$5,000.

\* \* \* \* \*

OPERATIONS DURING THE FISCAL YEAR ENDING JUNE 30, 1903.

The training wall was built up to a uniform height of 3½ feet below high water, under emergency contract with Roderick G. Ross, of Jacksonville, Fla., dated October 31, 1902. Two thousand five hundred and thirteen cubic yards of stone were placed in the work.

A contract for dredging in the inner harbor and in Academy Creek was made November 19, 1902, with Morris & Cumings Dredging Company, of New York City. Work was begun in Academy Creek February 19, 1903. At the close of the fiscal year the dredging in Academy Creek was completed, 23,783 cubic yards having been removed, giving a channel 18 feet deep at mean low water and 30 feet wide, from the mouth of the creek to the old Altamaha Canal. Dredging in the inner harbor (East River) was begun April 1, 1903; at the close of the fiscal year about 90,000 cubic yards had been removed. The rate of progress has been far below the contract requirements. The contractors, however, are making a change in their method of dredging, and expect to be able to remove the material at the required rate.

No work has been done as yet on the outer bar. The amount available for this portion of the work, viz, \$40,000, is not sufficient to do the work by contract, and it will have to be done by Government sea-going dredge. The most desirable route for dredging across the bar has not yet been determined upon, and will not be located until a suitable dredge to do the work is available.

COMMERCE AND NAVIGATION.

Information in regard to the commerce of Brunswick before the improvement will be found on page 1523 of the Report of the Chief of Engineers for 1897. Since 1880 the annual tonnage of the port and its value have grown very much, the shipments of cotton, for instance, having increased from 4,000 bales in 1885 to 200,541 in 1897.

The chief articles of export are cotton, lumber, and naval stores, of which the shipments for the year 1902 were as follows: Of cotton, 133,788 bales; of lumber, 240,773,000 feet, and of naval store, 71,186 barrels of turpentine and 287,732 barrels of rosin.

The regular lines of steamships established between this port and New York and Boston comprise a total of 13 steamers. During the year 1902 they made 111 round trips and carried 181,066 tons of freight.

On the inland waters there are a number of small steamers plying between Brunswick and adjacent ports, besides numerous schooners

and small sailboats. It is estimated that for the year 1902 this portion of the commerce amounted to 17,470 tons, valued at \$1,747,000.

The total tonnage of the port, inward and outward bound, coastwise and foreign, during 1902 was 1,017,423 tons, valued at \$27,372,638.

*Money statement.*

July 1, 1902, balance unexpended .....	\$165,182.75
June 30, 1903, amount expended during fiscal year .....	27,692.36
July 1, 1903, balance unexpended .....	137,490.39
July 1, 1903, outstanding liabilities .....	2,126.43
July 1, 1903, balance available .....	135,363.96
July 1, 1903, amount covered by uncompleted contracts .....	91,871.60
{ Amount that can be profitably expended in fiscal year ending June 30, 1905, for maintenance of improvement, in addition to the balance unexpended July 1, 1903. ....	
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899. ....	
	30,000.00

AMOUNT AND DATE OF ALL APPROPRIATIONS.

Since the work of improvement was begun the following appropriations have been made:

By act of Congress of—

July 4, 1836 .....	\$10,000
March 3, 1879 .....	20,000
June 14, 1880 .....	10,000
March 3, 1881 .....	5,000
August 2, 1882 .....	25,000
July 5, 1884 .....	10,000
August 5, 1886 .....	22,500
August 11, 1888 .....	35,000
September 19, 1890 .....	35,000
July 13, 1892 .....	27,500
Total .....	200,000
For maintenance:	
August 18, 1894 .....	10,000
June 3, 1896 .....	15,000
March 3, 1899 .....	10,000
Aggregate .....	235,000
By act of Congress of June 13, 1902:	
Outer bar .....	\$40,000
Inner harbor .....	120,000
Academy Creek .....	5,000
	165,000
Total of all appropriations .....	400,000

CONTRACTS IN FORCE.

Name and address of contractor.	Character of work.	Rate per cubic yard.	Date of approval.	Work begun.	Expires.
Roderick G. Ross, Jacksonville, Fla. <sup>a</sup>	Repairs to training wall (stone).	\$3.20	Emergency; no approval.	Dec. 9, 1902	Jan. 29, 1903
Morris & Cumings Dredging Co., New York, N. Y.	Dredging .....	.20	Dec. 11, 1902	Feb. 19, 1903	Mar. 19, 1904

<sup>a</sup> Completed January 9, 1903.



# 1166 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

## COMMERCIAL STATISTICS.

### *Exports and imports.*

	Tons.	Value.
Exports, domestic (coastwise) and foreign .....	936,481	13,711,520
Imports .....	63,472	11,914,118
Total .....	999,953	25,625,638

### *Steamship lines.*

Line.	Steamers.	Voyages.	Freight.
Mallory Steamship Line: Brunswick to New York .....	7	65	Tons. 138,695
The Clyde Line: Brunswick to New York and Boston .....	6	46	42,371
Total .....	13	111	181,066

### *Arrivals and clearances of vessels and commerce at Brunswick, Ga., 1902.*

	Coastwise.			Foreign ports.						Total.		
				American vessels.			Foreign vessels.					
	No.	Tons.	Crew.	No.	Tons.	Crew.	No.	Tons.	Crew.	No.	Tons.	Crew.
Arrived .....	495	480,153	7,748	21	11,544	167	75	54,034	1,064	591	545,731	8,979
Cleared .....	470	432,913	6,939	16	10,728	150	110	10,581	1,731	600	454,222	8,820

### *Commerce (coastwise and foreign), 1902.*

Value of exports .....	\$13,711,520.00
Value of imports .....	11,914,118.00
Total collection .....	4,342.14

### *Statement of receipts of naval stores, 1902.*

Rosin .....	barrels..	301,049
Spirits .....	do.....	76,267

## P 9.

### IMPROVEMENT OF INSIDE WATER ROUTE BETWEEN SAVANNAH, GEORGIA, AND FERNANDINA, FLORIDA.

The description of this route will be found in the Report of the Chief of Engineers for 1900, page 1953, and the waters forming it are also shown on Coast Survey Charts Nos. 156 and 157.

\* \* \* \* \*

### OPERATIONS DURING THE FISCAL YEAR ENDING JUNE 30, 1903.

A contract was made March 28, 1903, with George T. Warner, of Savannah, Ga., for dredging at the following points along the inside route, viz: The Dividings, Jekyl Creek, mouth of Jekyl Creek, and in Mud River. It is expected that work under this contract will commence about July 20. A survey of the above localities was made during the year.

## COMMERCE AND NAVIGATION.

A detailed discussion of the commerce over this route will be found in the Report of the Chief of Engineers for 1901, page 1653.

For the calendar year 1902 the commerce over this route amounted to 31,579 tons of freight, valued at about \$2,210,530, besides 150,000,000 feet B. M. of timber, valued at about \$1,500,000. There were carried by the boats over this route 61,250 passengers, principally between Brunswick and Cumberland and St. Simons Islands, Georgia, Fernandina, Fla., and Darien, Ga. None of this commerce went over the entire route.

*Money statement.*

July 1, 1902, balance unexpended.....	\$15,084.34
June 30, 1903, amount expended during fiscal year.....	518.18
July 1, 1903, balance unexpended.....	14,566.16
July 1, 1903, amount covered by uncompleted contracts.....	13,000.00
Amount (estimated) required for completion of existing project.....	41,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903:	
For works of improvement .....	\$41,000.00
For maintenance of improvement .....	15,000.00
	56,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

## AMOUNT AND DATE OF ALL APPROPRIATIONS.

Previous to the existing project there were appropriated as follows:

## Parsons cut or Romerey marshes, Georgia:

## Act of Congress approved—

August 2, 1882 .....	\$10,000.00
July 5, 1884 .....	10,000.00
August 5, 1886 .....	17,475.00
August 11, 1888 .....	4,633.77

Total by United States .....	42,108.77
------------------------------	-----------

From Georgia and Florida Steamboat Company.....	5,000.00
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Total.....	47,108.77
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## Jekyl Creek, Georgia:

## Act of Congress approved—

August 11, 1888 .....	5,000.00
September 19, 1890 .....	7,500.00
July 13, 1892 .....	7,500.00
August 18, 1894 .....	4,000.00

Total .....	24,000.00
-------------	-----------

Since the existing project for improving this route was adopted four appropriations, aggregating \$64,000, have been made, as follows:

## Inside route:

## Act of Congress approved—

July 13, 1892 .....	\$15,000.00
August 18, 1894 .....	20,000.00
June 3, 1896 .....	14,000.00
June 13, 1902 .....	15,000.00

64,000.00
-----------

Making a total of.....	135,108.77
------------------------	------------

## CONTRACT IN FORCE.

Contractor: George T. Warner, Savannah, Ga.  
 Character of work: Dredging.  
 Rate: 16½ cents per cubic yard.  
 Date of approval: April 16, 1903.  
 Work begun: Not yet started.  
 Expires: May 16, 1904.

## P 10.

## IMPROVEMENT OF CUMBERLAND SOUND, GEORGIA AND FLORIDA.

The entrance to Cumberland Sound is situated between Cumberland Island, Georgia, and Amelia Island, Florida. The principal port is Fernandina, in the State of Florida.

## OPERATIONS DURING THE FISCAL YEAR ENDING JUNE 30, 1903.

Jetty work was continued throughout the fiscal year by Christie, Lowe & Heyworth under their contract. There was placed on the north jetty 131,852.92 tons of first-class stone, 30,263.65 tons of second-class stone, and 15,131.83 tons of third-class stone; and on the south jetty 50,485.93 tons of first-class stone, 36,960.48 tons of second-class stone, and 18,480.24 tons of third-class stone. There had been placed on both jetties, under the contract with Christie, Lowe & Heyworth, up to June 30, 1903, 374,769.82 tons of first-class stone, 195,861.25 tons of second-class stone, and 97,930.62 tons of third-class stone, at a total cost of \$1,412,924.98.

*Dredging.*—The U. S. dredge *Cumberland* was completed during the fiscal year and arrived at Fernandina on January 9, 1903. The *Cumberland* is a seagoing dredge, 200 feet long, 40 feet beam, and is fitted with two 18-inch centrifugal pumps. She began dredging operations in the jetty channel on January 16, 1903, and left, to be hauled out for repairs and to be coppered, on May 28, 1903. During this period 379,571 cubic yards of material was removed, which resulted in the formation of a new channel, a little to the north of the old one, having a least width of about 100 feet and a controlling depth of 24 feet at mean low water. The rise of the tide is 7 feet.

*Surveys.*—During the year six surveys of the entrance have been made. The last survey was finished in June, 1903, but the results have not yet been platted. Computations have been made from each survey showing the movement of sand in different sections of the area surveyed.

*Future work on jetties.*—The amount remaining on June 30, 1903, of the funds allotted for contract work will be sufficient to build up the shore end of the north jetty to about 1 foot above high water; to complete the riprap reenforcement of the north jetty between stations 2000 and 12700; to reenforce a portion of the north jetty between the shore and station 2000; to fill the low places in the north jetty, except on the outer end; and to fill the hole in the south jetty at station 3700. It is probable that this work will be finished before the end of July, 1903.

The controlling channel depth into the inner harbor at Fernandina, Fla. was 24 feet at mean low water on June 30, 1903.

## CONDITION OF JETTIES JUNE 30, 1903.

*North jetty.*—This jetty, except for a few low places where settlement has occurred or stones have been displaced by wave action, is completed to high water from the shore to station 19000. The width at high water from station 0 to station 12700 is 8 feet, and from station 12700 to station 19000 it is 15 feet. An apron of riprap stone, 60 feet wide, has been laid on the inner side of this jetty from station 17165 to station 19000. This was placed to guard against excessive deepening at the foot of the jetty. The outer end of the jetty has been reenforced by riprap placed on the north and east slopes. A steel tower, suitable for a light station, has also been placed here. The inner slope of the jetty has been reenforced by riprap between station 2000 and station 10677. It was found necessary to do this because the difference in head between the water inside and outside was frequently so great that the water flowing through the jetty caused a dangerous scour at the base on each side. As this portion of the jetty consisted almost entirely of large blocks on an insufficient foundation (placed during former contracts) composed of a thin layer of light stone on log or brush mattresses, the barrier formed by the jetty, while sufficient to cause the difference in head mentioned, was not sufficient to stop the flow between the interstices. The reenforcement of riprap has stopped this flow and the current now runs parallel with the jetty. The space north of the jetty is being rapidly filled with sand. The shore end between low and high water marks is about 4 feet above low water, having settled to that elevation from high water, its original height.

*South jetty.*—This jetty was originally completed to high water from station 0 to station 7500 and to 5 feet below low water from station 7500 to station 11000. A slight reduction in height, due to settlement or displacement by wave action, has occurred near the shore end and at station 3700. An apron of riprap about 60 feet wide has been laid against the inner slope between station 7420 and station 8937. The width at high water is 8 feet.

## BREACH ON CUMBERLAND ISLAND.

During the hurricane in the fall of 1898 a breach was made across the outer beach of Cumberland Island, a short distance north of the north jetty, which permits a flow of water across the beach between the ocean and Beach Creek. This flow is stopped when the tide is below 4 feet above mean low water. The work done by the hurricane consisted in washing away a covering of about 2 feet of sand and leaving bare an expanse of marsh mud which successfully resists erosion. The condition here has been about the same since the breach was made. This breach should be closed eventually, but immediate action is not necessary.

## COMMERCE AND NAVIGATION.

Neglecting the commerce of St. Marys, Ga., the total commerce of the harbor of Fernandina during the calendar year 1902 amounted to 665,441 tons, with a value of \$4,694,496. The details of this commerce are given in the tables appended hereto.

1170 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

*Money statement.*

July 1, 1902, balance unexpended .....	\$846, 068. 67
Amount appropriated by sundry civil act approved March 3, 1903 .....	400, 000. 00
	<hr/>
June 30, 1903, amount expended during fiscal year .....	1, 046, 068. 67
	<hr/>
July 1, 1903, balance unexpended .....	250, 045. 06
July 1, 1903, outstanding liabilities .....	83, 353. 01
	<hr/>
July 1, 1903, balance available .....	166, 692. 05
	<hr/>
July 1, 1903, amount covered by uncompleted contracts .....	22, 362. 74
	<hr/>
(Amount (estimated) required for completion of existing project .....	95, 000. 00
Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903:	
For works of improvement .....	\$95, 000. 00
For maintenance of improvement .....	50, 000. 00
	<hr/>
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	145, 000. 00

AMOUNT AND DATE OF ALL APPROPRIATIONS.

Under the original project for improving Cumberland Sound the following appropriations were made for the work:

By act of Congress of—	
June 14, 1880 .....	\$30, 000
March 3, 1881 .....	100, 000
August 2, 1882 .....	50, 000
July 5, 1884 .....	75, 000
August 5, 1886 .....	112, 500
August 11, 1888 .....	112, 500
	<hr/>
Total .....	480, 000

Under the revised project of improvement the following appropriations were made:

By act of Congress of—	
September 19, 1890 .....	\$112, 500
July 13, 1892 .....	170, 000
August 17, 1894 .....	170, 000
	<hr/>
Total .....	452, 500

Under the existing project of improvement the following appropriations have been made:

By act of Congress of—	
June 3, 1896 .....	\$5, 000
June 4, 1897 .....	350, 000
July 19, 1897 .....	50, 000
July 1, 1898 .....	450, 000
March 3, 1899 .....	400, 000
March 3, 1901 .....	200, 000
June 28, 1902 .....	400, 000
	<hr/>
Total .....	1, 855, 000

## CONTRACT IN FORCE.

Name and address of contractor.	Character of work.	First-class stone (per ton).	Second-class stone (per ton).	Third-class stone (per ton).	Mattresses (per square yard).	Date of approval.	Work begun.	Expires.
Christie, Lowe & Heyworth, Chicago, Ill.	Jetty ....	\$2.15	\$2.15	\$1.90	<i>Cents.</i> 70	Aug. 30, 1900	Nov. 1, 1900	Within 4 years from commencement of work, subject to the provisions of paragraph 53 of the specifications.

## COMMERCIAL STATISTICS.

*Arrivals and clearances of vessels and commerce at Fernandina, Fla., 1902.*

	Coastwise.			Foreign ports.						Total.		
				American vessels.			Foreign vessels.					
	No.	Tons.	Crew.	No.	Tons.	Crew.	No.	Tons.	Crew.	No.	Tons.	Crew.
Arrived .....	319	286,266	2,867	19	8,216	116	32	30,469	472	470	324,951	3,455
Cleared .....	223	190,076	1,834	11	6,741	92	111	140,673	1,771	345	337,490	3,697

## COMMERCE.

Value of exports:	
Foreign .....	\$3, 163, 816. 00
Coastwise .....	1, 435, 680. 00
Value of imports:	
Foreign .....	75, 000. 00
Coastwise .....	20, 000. 00
Total commerce .....	4, 694, 496. 00
Duties collected .....	39. 90

## P II.

## REMOVING SUNKEN VESSELS OR CRAFT OBSTRUCTING OR ENDANGERING NAVIGATION.

On May 22, 1903, the Secretary of War allotted \$1,000 for the removal of the wreck of the schooner *Livingston*, in Savannah Harbor, Georgia. The work of removal was awarded to John Rourke & Sons, of Savannah, Ga., at \$375, under ten-day bids. The removal of the wreck has been begun, but at the close of the fiscal year the work had not been completed.

On May 21, 1903, the Secretary of War allotted \$9,570 for the removal of the wrecks *City of Austin*, *Franconia*, and *Puntalunos* in Cumberland Sound, Georgia and Florida. Bids for the removal of these wrecks were called for, but none were received. It is proposed to readvertise the work by circular letter for thirty days.



## APPENDIX Q.

### IMPROVEMENT OF RIVERS AND HARBORS ON THE EASTERN COAST OF FLORIDA, AND OF HARBOR AT KEY WEST, FLORIDA, AND ENTRANCE THERETO.

REPORT OF CAPT. FRANCIS R. SHUNK, CORPS OF ENGINEERS,  
OFFICER IN CHARGE, FOR THE FISCAL YEAR ENDING JUNE 30,  
1903, WITH OTHER DOCUMENTS RELATING TO THE WORKS.

#### IMPROVEMENTS.

- |  |   |
|--|---|
| 1. St. Johns River, Florida.                               | 9. Removing the water hyacinth from<br>Florida waters.                              |
| 2. St. Johns River at Orange Mills Flats,<br>Florida.      | 10. Dredge for river and harbor improve-<br>ments, Florida.                         |
| 3. Volusia Bar, Florida.                                   | 11. Removing sunken vessels or craft<br>obstructing or endangering naviga-<br>tion. |
| 4. Oklawaha River, Florida.                                |   |
| 5. St. Augustine Harbor, Florida.                          |   |
| 6. Indian River, Florida.                                  |   |
| 7. Biscayne Bay, Florida.                                  |   |
| 8. Harbor at Key West, Florida, and en-<br>trance thereto. |   |

#### HARBOR LINES.

12. St. Johns River at Jacksonville, Florida.

UNITED STATES ENGINEER OFFICE,  
*Jacksonville, Fla., July 20, 1903.*

GENERAL: I have the honor to submit herewith annual report upon  
the works of river and harbor improvement, east coast, Florida, for  
the fiscal year ending June 30, 1903.

Very respectfully, your obedient servant,

FRANCIS R. SHUNK,  
*Captain, Corps of Engineers.*

Brig. Gen. G. L. GILLESPIE,  
*Chief of Engineers, U. S. A.*

#### Q 1.

#### IMPROVEMENT OF ST. JOHNS RIVER, FLORIDA.

For description, original project, results, etc., see summary, page  
271, and Report of the Chief of Engineers for 1896, pages 1305-1312;  
Report of the Chief of Engineers for 1895, pages 1586-1604 (the latter



being a report upon a survey of St. Johns River, Florida, from Jacksonville to the ocean, with a view to securing a 24-foot channel), and Report of the Chief of Engineers for 1898, pages 1327-1330.

The funds appropriated and authorized by act of June 13, 1902, are to be expended in accordance with the general project of June 3, 1896, under the following supplemental project:

To raise the south jetty at the entrance to mean high water from the shore end out to station 10000.

To raise the north jetty to high water throughout its present length.

The training wall at White Shells shoal to be extended to shore from its lower end (as shown by the map) and its entire length built up to mean high water.

A similar training wall to be constructed between Long Island and Le Barron Island. This is designated Long Island training wall.

Coon Point dam and cut-off dam to be built up to mean high water. A similar dam to be constructed between Alligator Island and Radcliffe Island, designated Alligator dam.

Dames Point and island training walls to be removed. A new training wall, designated Radcliffe training wall, to be constructed, extending upstream from Radcliffe Island a distance of 7,000 feet, as shown on map.

The necessary dredging to be done to form a channel 300 feet wide and 24 feet deep at mean low water.

By direction of the department the preparation of the plans and the construction of the seagoing suction dredge provided for in the act of June 13, 1902, was assigned to Capt. J. C. Sanford, Corps of Engineers. It is understood that this dredge is now being constructed.

The U. S. dredge *Winyah Bay* worked on the shoals in the river from August 5 to October 4, 1902. The dredge began work on the shoals again on February 4, 1903. At the end of June this work was still in progress. During the fiscal year ending June 30, 1903, 53,675 cubic yards were removed from Mile Point shoal, 35,986 cubic yards from White Shells shoal, 38,481 cubic yards from Browns Creek shoal, and 103,336 cubic yards from Dames Point shoal.

On February 25, 1903, a contract for dredging to a depth of 20 feet in the river along the line of the present channel was entered into with the Coastwise Dredging Company, Baltimore, Md. \* \* \* At the end of the fiscal year no work had been done.

On March 6, 1903, a contract was entered into with Roderick G. Ross, Jacksonville, Fla., for building up the jetties at the entrance. \* \* \* Work began under this contract June 24, 1903. At the end of the fiscal year 2,099.39 tons of first-class stone, 490.49 tons of second-class stone, and 202.42 cubic yards of third-class stone had been placed in the north jetty.

Bids for the proposed work on the training walls in the river were opened March 10, 1903. All bids received at that time were rejected, and the work was readvertised May 9, 1903. The bids received were opened June 9, 1903. The contract was awarded to Roderick G. Ross, Jacksonville, Fla., and was executed June 30, 1903. The prices for this work are as follows: Stone, \$1.83 per cubic yard; oyster shell, \$1 per cubic yard; removing old material and placing it in the new work, \$0.40 per cubic yard; removing old material and placing it elsewhere than in new work, \$0.30 per cubic yard.

On April 20, 1903, the Secretary of War authorized the construc-

tion of a dredge for this improvement, using the machinery of the condemned dredge *Alpha* belonging to the Mississippi River Commission. This machinery consists of a 30-inch centrifugal dredging pump and engine, a 15-inch jet pump and engine, four boilers, winches, etc. The hull for this dredge and the special castings required were designed and bids for its construction were solicited by circular letter June 18. The bids were opened June 30, 1903. Four bids were received, the lowest being that of F. E. Blackmer and David Warrington, which was accepted. The amount of the bid was \$12,305. The hull is to be completed within sixty-five days after date of notification of approval of the contract.

The map of the survey of the entrance to the river made in May and June, 1903, is submitted herewith. A comparison of this map with that of the survey made in April, 1902, shows that the channel across the bar which had been dredged between the months of November and April, 1901 and 1902, has been obliterated. The deepening which was noticed last year inside the crest of the bar north of the line of dredging has extended across the bar, and while there appears to be an available depth of only 14 feet across the bar, the channel is more than 1,000 feet wide between the 13-foot contours. The bar has advanced seaward about 350 feet. The channel has continued to deepen close to the outer portion of the north jetty, but this portion of the channel is narrower than it was last year.

The accumulation of sand along the inner side of the north jetty, between stations 3600 and 7600, continues.

As has been noted for the past two years, the slope of the western side of the large shoal, near the inside of the north jetty, continues to flatten. The channel west of this shoal is widening and the channel depth is decreasing.

The profiles of the jetties show no appreciable changes during the past year. That this is the case along that portion of the north jetty beyond station 11000 is worthy of comment. This portion of the jetty has a bottom width of only 50 feet and has no mattress foundation, the stone being deposited directly upon the sand bottom in a depth of only about 10 feet. It is exposed to the force of the heaviest waves and the channel has scoured to a depth of 28 feet close along the inner side. This encroachment of the channel was observed last year and it was apprehended that injury to the work would result unless a revetment was constructed along the channel side. This revetment is now being placed. The foundation requires widening in any event to support the superstructure with the proper slope.

The channel in the river above the entrance shoaled in places during the past year, but the work of the dredge *Winyah Bay* has improved its condition. It is now better in most places than it has been for some years. There will soon be an available channel depth of 17 feet at mean low water throughout.

A series of comparative maps on a small scale, showing the entrance to the river yearly from 1894 to 1903, continuing the series from 1879 to 1893, published in the Report of the Chief of Engineers for 1903, is submitted herewith.

# 1176 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

## Money statements.

### EMERGENCY APPROPRIATION.

July 1, 1902, balance unexpended .....	\$798. 28
June 30, 1903, amount expended during fiscal year .....	69. 07
July 1, 1903, balance unexpended .....	729. 19
July 1, 1903, outstanding liabilities .....	729. 19

### GENERAL IMPROVEMENT.

July 1, 1902, balance unexpended .....	\$351, 804. 39
Amount appropriated by sundry civil act approved March 3, 1903 .....	350,000. 00
June 30, 1903, amount expended during fiscal year .....	701, 804. 39
July 1, 1903, balance unexpended .....	25, 453. 28
July 1, 1903, balance unexpended .....	676, 351. 13
July 1, 1903, outstanding liabilities .....	9, 500. 00
July 1, 1903, balance available .....	666, 851. 13
July 1, 1903, amount covered by uncompleted contracts .....	372, 969. 32
(Amount (estimated) required for completion of existing project .....	1, 009, 750. 00
Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903:	
For works of improvement .....	\$500,000. 00
For maintenance of improvement .....	25,000. 00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	525,000. 00

### APPROPRIATIONS FOR IMPROVEMENT OF ST. JOHNS RIVER, FLORIDA.

Under the original project the following appropriations were made for the work:

June 14, 1880 .....	\$125,000
March 3, 1881 .....	100,000
August 2, 1882 .....	150,000
July 5, 1884 .....	150,000
August 5, 1886 .....	150,000
August 11, 1888 .....	175,000
September 19, 1890 .....	170,000
July 13, 1892 .....	112,500
March 3, 1893 .....	284,500
Total .....	1,417,000

Under the existing project of improvement appropriations have been made—

June 3, 1896 .....	\$200,000
March 3, 1899 .....	200,000
June 13, 1902 .....	350,000
March 3, 1903 .....	350,000
Total .....	1,100,000
June 6, 1900 (allotment and emergency appropriation) .....	10,000
Aggregate .....	2,527,000

<sup>a</sup> And continuing contract for \$950,000.

# APPENDIX Q—REPORT OF CAPTAIN SHUNK.

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## CONTRACTS IN FORCE DURING FISCAL YEAR.

Contractor: Coastwise Dredging Company.  
Work: Dredging St. Johns River, Florida.  
Dated: February 25, 1903.  
Approved: March 24, 1903.  
Date of beginning: May 27, 1903.  
Date of completion: As provided in specifications.  
Quantities: About 400,000 cubic yards, at 21.5 cents per cubic yard.  
Contractor: Roderick G. Ross.  
Work: Jetty construction.  
Dated: March 6, 1903.  
Approved: March 18, 1903.  
Date of beginning: June 24, 1903.  
Date of completion: As provided in specifications.  
Quantities: About 90,000 tons first-class stone, \$2.22 per ton; about 40,000 tons second-class stone, \$2.22 per ton; about 5,000 tons third-class stone, \$2.13 per cubic yard.

## COMMERCIAL STATISTICS.

*Commerce of St. Johns River, Florida, during the year ending December 31, 1902.*

[Furnished by Jacksonville Board of Trade.]

Articles.	Gross tonnage.	Articles.	Gross tonnage.
Yellow pine lumber .....	248,518	Bacon .....	60,745
Cypress lumber .....	10,214	Potatoes .....	1,837
Shingles .....	142,260	Canned goods .....	3,500
Cross-ties .....	872,500	Flour .....	44,000
Cedar logs .....	145	Salt .....	2,027
Laths .....	81	Beans .....	825
Sea island cotton .....	5,626	Coffee .....	270
Tobacco .....	88	Hay .....	18,750
Oranges .....	3,263	Steel rails .....	23,540
Vegetables .....	4,600	Corn and oats .....	12,375
Doors .....	52	Naval stores .....	60,000
Kaolin .....	5,056	Brick .....	37,500
Miscellaneous packages .....	85,718	Gasoline .....	3,450
Coal .....	33,907	Fertilizers .....	6,480
Oil .....	15,689	Wines and liquors .....	3,657
Boots and shoes .....	1,561		
Sugar .....	2,530	Total .....	1,710,754

*Arrivals and departures of vessels for the year ending December 31, 1902.*

	Arrivals.		Departures.	
	Number.	Tons.	Number.	Tons.
Steam.....	215	555,304	215	558,340
Sailing.....	306		324	
Total.....	520		539	

Estimated number of passengers carried by water..... 475,000  
Estimated percentage of total trade of neighborhood carried by water, per cent ..... 25  
Probable increase of trade were the improvement completed, per cent ..... 200

## Q 2.

IMPROVEMENT OF ST. JOHNS RIVER AT ORANGE MILLS FLATS,  
FLORIDA.

For description, project, and work done see summary, Report of the Chief of Engineers for 1898, pages 1344-1348, and Report of the Chief of Engineers for 1901, page 1738.

The act of June 13, 1902, appropriated \$30,000 for this improvement.

On October 12, 1902, a contract for dredging was entered into with P. Sanford Ross, Incorporated. \* \* \* Work began under this contract May 5, 1903. At the end of the fiscal year 25,376.4 cubic yards had been removed from Orange Mills flats and 87,855.5 cubic yards from Racey Point shoal, completing the channel through Orange Mills flats to a width of 160 feet and a least depth of 13 feet, and forming a channel through Racey Point shoal 120 feet wide for a distance of 4,882 feet and 40 feet wide for a distance of 1,263 feet, with a least depth of 13 feet.

*Money statement.*

July 1, 1902, balance unexpended .....	\$30,277.44
June 30, 1903, amount expended during fiscal year .....	6,315.76
July 1, 1903, balance unexpended .....	23,961.68
July 1, 1903, outstanding liabilities .....	8,450.00
July 1, 1903, balance available .....	15,511.68
July 1, 1903, amount covered by uncompleted contracts.....	13,412.18
{ Amount (estimated) required for completion of existing project .....	50,000.00
{ Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903.....	50,000.00
{ Submitted in compliance with requirements of sundry civil act of June 4, 1897.	

## APPROPRIATIONS.

Act of—	
March 3, 1899.....	\$40,000
June 13, 1902 .....	30,000
Total .....	70,000

## CONTRACT IN FORCE DURING FISCAL YEAR.

Contractor: P. Sanford Ross, incorporated.

Work: Dredging St. Johns River, Orange Mills flats.

Dated: October 27, 1902.

Approved: November 11, 1902.

Date of beginning: May 5, 1903.

Date of completion: As provided in the specifications.

Quantities: About 225,000 cubic yards of material, at 12 cents per cubic yard.

<sup>a</sup> The balance unexpended July 1, 1902, was given as \$30,284.38. From this is to be deducted Treasury settlement No. 17830, February 25, 1902, for \$6.94, leaving a balance of \$30,277.44.

## COMMERCIAL STATISTICS.

*Commerce of Orange Mills Flats during the year ending December 31, 1902.*

[Furnished by Board of Trade, Palatka, Fla.]

Articles.	Gross tonnage.	Articles.	Gross tonnage.
Fertilizers .....	1,200	Railroad supplies .....	1,000
Shingles .....	15,000	Sash, doors, and blinds.....	4,500
Lumber .....	100,000		
Merchandise .....	16,000	Total .....	137,950
Fish and oysters .....	250		

*Arrivals and departures of vessels for the year ending December 31, 1902.*

	Arrivals.	Departures.
Steam .....	4	4
Sailing .....	90	90
Total .....	94	94

## Q 3.

## IMPROVEMENT OF VOLUSIA BAR, FLORIDA.

Since July, 1899, no work has been done at this place.

For description, project, and results, see summary, page 274, and the Reports of the Chief of Engineers for 1897, page 1550, and for 1896, pages 1313 and 1314.

*Money statement.*

July 1, 1902, balance unexpended .....	\$2,000. 00
July 1, 1903, balance unexpended .....	2,000. 00

{ Amount that can be profitably expended in fiscal year ending June 30, 1905, for maintenance of improvement, in addition to the balance unexpended July 1, 1903 .....	4,000. 00
{ Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

## APPROPRIATIONS.

Act of—		Act of—	
June 14, 1880 .....	\$5,000	July 13, 1892 .....	\$1,000
March 3, 1881 .....	5,500	August 18, 1894 .....	1,000
August 2, 1882 .....	5,000	June 3, 1896 .....	1,000
July 5, 1884 .....	2,000	March 3, 1899 .....	2,000
August 5, 1886 .....	7,500	June 13, 1902 .....	2,000
August 11, 1888 .....	500		
September 19, 1890 .....	500	Total .....	33,000

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## COMMERCIAL STATISTICS.

*Commerce of Volusia bar, Florida, during year ending December 31, 1902.*

[Furnished by the Clyde Steamship Company.]

	Tons.		Tons.
Cattle and live stock.....	142	Ship stores.....	968
Fertilizers.....	6,210	Vegetables.....	3,022
Fruits.....	460	Fish and oysters.....	306
Grain.....	6,015	Railroad supplies.....	200
Hides.....	32	Tobacco.....	29
Honey, sirup, etc.....	8	Hay.....	2,700
Lumber, rough and dressed.....	20,143		
Merchandise.....	12,468	Total.....	53,677
Oranges.....	974		

*Arrivals and departures of vessels for the year ending December 31, 1902.*

	Arrivals.		Departures.	
	Number.	Tons.	Number.	Tons.
Steamers.....	260	95,400	260	95,400

Estimated number of passengers carried by water, 33,114.

## Q 4.

### IMPROVEMENT OF OKLAWAHA RIVER, FLORIDA.

For description, project, and results, attention is invited to the Report of the Chief of Engineers for 1896, pages 1314 to 1316, and to summary, page 275.

No work was done.

No commercial statistics are available.

### *Money statement.*

July 1, 1902, balance unexpended.....	\$2,000.00
July 1, 1903, balance unexpended.....	2,000.00
(Amount (estimated) required for completion of existing project.....	16,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903:	
For works of improvement.....	\$16,000.00
For maintenance of improvement.....	3,000.00
	19,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

### APPROPRIATIONS.

Act of—		Act of—	
September 19, 1890.....	\$10,000	March 3, 1899.....	\$3,000
July 13, 1892.....	1,000	June 13, 1902.....	2,000
August 18, 1894.....	3,000		
June 3, 1896.....	3,000	Total.....	22,000

## Q 5.

## IMPROVEMENT OF ST. AUGUSTINE HARBOR, FLORIDA.

For history, description, and project, see current summary, page 275, and Report of Chief of Engineers, 1896, pages 1316–1317.

During the year the sand catches normal to the dam have been built up plank by plank as the sand accumulated. Since June, 1902, about 4,893 cubic yards of sand have been impounded in a length of 330 feet. The shore is now about 8 feet above mean low water, and is fully up to the general level. Encroachment of the sea has been effectually stopped. The work is regarded as finished, and no further operations are recommended.

There is no commerce by water at St. Augustine.

*Money statement.*

July 1, 1902, balance unexpended .....	\$928. 79
June 30, 1903, amount expended during fiscal year .....	649. 65
July 1, 1903, balance unexpended .....	279. 14
Amount (estimated) required for completion of existing project .....	24, 000. 00

## APPROPRIATIONS.

Act of—	
August 11, 1888 .....	\$35, 000
September 19, 1890 .....	20, 000
July 13, 1892 .....	10, 000
August 18, 1894 .....	6, 000
Total .....	71, 000

## Q 6.

## IMPROVEMENT OF INDIAN RIVER, FLORIDA.

(1) *Indian River between Goat Creek and Jupiter Inlet.*—No work during the year. See summary, page 276, and Report of Chief of Engineers for 1896, pages 1318 to 1320.

(2) *Negro Cut.*—No work during the year. See summary, page 276, and Reports of Chief of Engineers for 1894, pages 1227 et seq.; for 1896, pages 1318 and 1319, and for 1902, pages 1210 and 1211.

(3) *Jupiter Inlet.*—No work during the year. See summary, page 277, and Reports of Chief of Engineers for 1897, page 1554, and 1901, page 1743.



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## Money statement.

July 1, 1902, balance unexpended .....	\$2, 350. 54
June 30, 1903, amount expended during fiscal year .....	350. 54
July 1, 1903, balance unexpended .....	2, 000. 00
Amount (estimated) required for completion of existing project .....	27, 000. 00
Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903:	
For works of improvement.....	\$27, 000. 00
For maintenance of improvement.....	2, 000. 00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	29, 000. 00

## APPROPRIATIONS.

Act of—

July 13, 1892 (between Goat Creek and Jupiter Inlet) .....	\$15, 000
August 18, 1894 (Negro Cut) .....	5, 000
March 2, 1895 (Negro Cut) .....	15, 000
February 26, 1896 (Jupiter Inlet).....	500
June 3, 1896 (Negro Cut) .....	7, 500
March 3, 1899 (Negro Cut).....	5, 000
June 13, 1902 (between Goat Creek and Jupiter Inlet).....	2, 000
Total .....	50, 000
Allotment from emergency river and harbor appropriation of June 6, 1900, (for opening Jupiter Inlet).....	1, 000
Aggregate.....	51, 000

## COMMERCIAL STATISTICS.

*Commerce of Indian River, Florida, for the year ending December 31, 1902.*

[Furnished by Florida Coast Line Canal and Transportation Company.]

Articles.	Gross tonnage.	Articles.	Gross tonnage.
Cattle.....	2, 500	Oranges.....	2, 000
Fertilizers.....	7, 000	Pineapples.....	18, 000
Fruits.....	50	Vegetables.....	5, 000
Hides.....	25	Fish and oysters .....	10, 000
Honey, sirup, etc.....	50	Hay.....	250
Lumber.....	10, 000		
Merchandise.....	37, 000	Total.....	91, 875

Q 7.

## IMPROVEMENT OF BISCAYNE BAY, FLORIDA.

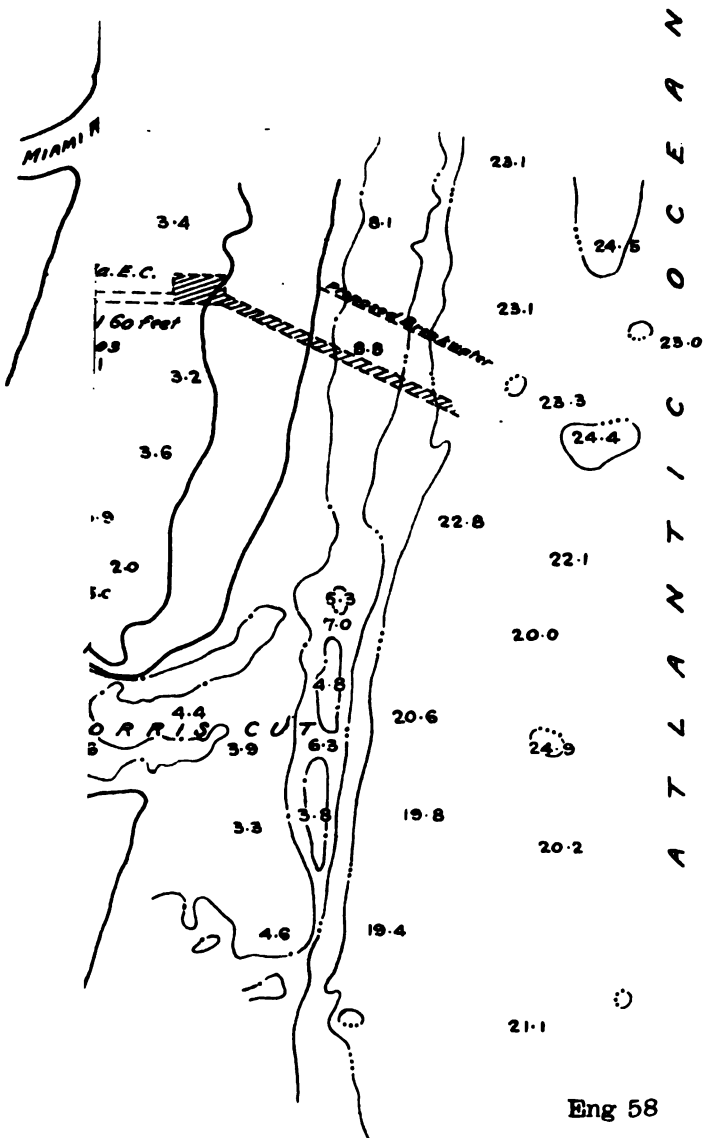
For description of the project and work done by the Florida East Coast Railway Company see summary, pages 277, and report and recommendations of a board of officers, which may be found in the Report of the Chief of Engineers for 1900, pages 1986-2013.

No work was done by the United States.



MIAMI

in the city of Miami to the Atlantic Ocean.  
the direction of  
Corps of Engineers, U.S. Army.





*Money statement.*

July 1, 1902, balance unexpended .....	\$50,000.00
Amount appropriated by sundry civil act approved March 3, 1903.....	250,000.00
	<hr/>
June 30, 1903, amount expended during fiscal year.....	300,000.00
	755.10
	<hr/>
July 1, 1903, balance unexpended.....	299,244.90

## APPROPRIATIONS.

Act of June 13, 1902 .....	\$50,000.00
Act of March 3, 1903.....	250,000.00
	<hr/>
Total.....	300,000.00

## COMMERCIAL STATISTICS.

*Commerce of Biscayne Bay during the year ending December 31, 1902.*

[Furnished by Mr. C. L. Myers, general manager of the Peninsular and Occidental Steamship Company.]

Name of articles.	Gross tonnage.	Name of articles.	Gross tonnage.
Cattle .....	20	Ship stores.....	311
Fertilizers .....	316	Vegetables .....	13
Grain .....	91	Fish and oysters.....	1
Honey, sirup, etc .....	1	Tobacco .....	58
Lumber, rough and dressed .....	691	Hay .....	6
Merchandise.....	6,866		
Oranges.....	27	Total .....	8,390

*Arrivals and departures of vessels for the year ending December 31, 1902.*

	Arrivals.	Departures.
Steamers.....	192	192

Estimated number of passengers carried by water, 10,906.

## Q 8.

## IMPROVEMENT OF HARBOR AT KEY WEST, FLORIDA, AND ENTRANCE THERETO.

For project, description, etc., see summary, page 278, and Report of the Chief of Engineers for 1896, pages 1325-1327; Report of Chief of Engineers for 1898, page 1371; Report of Chief of Engineers for 1900, page 1938.

On October 30, 1902, authority was given to remove, at the expense of this appropriation, an old wharf which obstructed navigation in the harbor of Key West. This was done in April and May, 1903, at a cost of \$300.

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## Money statements.

### GENERAL IMPROVEMENT.

July 1, 1902, balance unexpended .....	\$100, 170. 08
June 30, 1903, amount expended during fiscal year .....	400. 67
July 1, 1903, balance unexpended .....	99, 769. 41
{ Amount (estimated) required for completion of existing project .....	100, 000. 00
{ Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903 .....	100, 000. 00
{ Submitted in compliance with requirements of sundry civil act of June 4, 1897.	

### EMERGENCY APPROPRIATION.

July 1, 1902, balance unexpended .....	1, 013. 57
June 30, 1903, amount expended during fiscal year .....	1, 013. 57

### APPROPRIATIONS.

Act of—		Act of—	
August 2, 1882 .....	\$25, 000	Allotment from emergency river and harbor act, June 6, 1900 .....	\$10, 000
August 5, 1886 (survey) ....	2, 500	June 13, 1902 (rivers and harbors) .....	100, 000
August 11, 1888 .....	25, 000	Total .....	462, 500
September 19, 1890 .....	40, 000		
July 13, 1892 .....	75, 000		
August 18, 1894 .....	80, 000		
June 3, 1896 .....	80, 000		
March 3, 1899 .....	25, 000		

### COMMERCIAL STATISTICS.

#### Commerce of Key West, Fla., during the year ending December 31, 1902.

	Tons.		Tons.
Tobacco .....	431	Cattle .....	8, 788
Lumber and timber .....	538	Horses and mules .....	11
Sponges .....	250	Fruit, etc .....	28
Phosphates .....	4, 000	Shingles .....	25
Cigars .....	1	Total .....	14, 146
Fish and oysters .....	74		

#### Arrivals and departures of vessels for year ending December 31, 1902.

	Arrivals.		Departures.	
	Number.	Tons.	Number.	Tons.
Steamers .....	352	245, 308	342	238, 333
Sail vessels .....	171	15, 447	168	13, 263

Passengers arrived and departed, 18,954.

## Q 9.

### REMOVING THE WATER HYACINTH FROM FLORIDA WATERS.

For original condition, project, etc., see current summary, pages 279, and Report of the Chief of Engineers for 1899, pages 1612-1625, and Report of Chief of Engineers for 1901, pages 1746-1749.

Under the provisions of the act of August 13, 1902, the steamer *Le Rêve* was purchased October 6, 1902, for \$5,000. She had previously been a house boat, rented to pleasure parties. She was fitted up with spraying apparatus at a cost of \$1,343.99. This apparatus comprised a steam pump, four steel tanks of an aggregate capacity of about 3,000 gallons, hose, and nozzles. The hose, spraying pipes, and nozzles were supplied by the Harvesta Chemical Compounding Company.

The Harvesta chemical compound, which is used for spraying, is really a mechanical mixture of several ingredients, the active principle being arsenic acid. The compound does not entirely dissolve in water. It must be exposed for some time to a jet of steam, after which the undissolved particles remain in suspension. It is desirable, from motives of economy, to treat a large quantity at a time, so that tanks of considerable size are needed. The steamer not having room for such tanks a lighter was rented for \$50 a month, and fitted up with a boiler, steam pump, and two 8,000-gallon cypress tanks, at a cost of \$1,123.84. Work began on November 20 in Black Creek, a tributary of the St. Johns, about 20 miles above Jacksonville. The following is a summary of operations during the year:

From November 20 to December 3 the boat was worked at Black Creek.

December 4 to December 11, at Rice Creek, 4 miles below Palatka.

December 12 to 17 and December 29 to January 7, in the St. Johns River, near Palatka.

January 7 to January 10, in Deep Creek, about 10 miles below Palatka.

January 14 to February 6, in Lake Jessup.

April 4 to April 10, near Blue Springs.

April 10 to May 7, near Palatka.

In all, 242,503 gallons of the compound and water had been used over about 2,910,000 square yards of hyacinths, a proportion of 1 gallon to about 12 square yards. The mixture kills the hyacinth quickly and completely. The plants shrivel, the masses break up and drift away, and in a few days have ceased to be obstructive. On the other hand, the hyacinth multiplies with great rapidity. Its seed is abundant and as fine as dust, and is spread abroad over extensive tracts of water. Whole lakes and reaches of river are found covered with yellow or greenish scum, which under the glass is seen to be made up of minute hyacinth plants. In a few weeks these are ready to obstruct navigation. This process appears to be going on all through the vast swamps of central and southern Florida, and every rise of water brings acres of hyacinths into the St. Johns River. Extermination of the plant appears to be out of the question. The most that can be done is to clear the channel as often as it is obstructed.

The experience of the past year has shown that the present outfit is insufficient. Another boat is needed, which should be larger than *Le Rêve*. While the smaller boat worked in the smaller streams, the larger could find continuous employment in the St. Johns. I am of opinion that not less than \$150,000 per year will be needed for operating expenses in order to keep the channels open.

Work was suspended December 18–28, February 7 to April 3, and May 8 to June 30 on account of complaints that cattle were dying from eating the sprayed plant. These complaints were fully investigated and experiments were conducted at the expense of the Harvesta Chemical Compounding Company, May 15–20, in order to determine the effect of the compound upon stock. As a result of these investigations it

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appears that the compound is certainly injurious to cattle and probably caused some, but not all, of the deaths reported. The compound contains a large percentage of saltpeter, and indications—which, however, were by no means conclusive—pointed to this as the noxious ingredient. It was also found that the saltpeter contained a good deal of common salt as an impurity, and this probably made the sprayed plant attractive to cattle. As a substitute for the saltpeter bicarbonate of sodium was tried. It gave even better results and did not seem to be readily eaten by stock. It is proposed to use the bicarbonate compound in future.

## Money statement.

July 1, 1902, balance unexpended.....	\$34, 915. 61
Allotted since.....	25, 000. 00
	<hr/>
	59, 915. 61
June 30, 1903, amount expended during fiscal year.....	22, 535. 18
	<hr/>
July 1, 1903, balance unexpended.....	37, 380. 43
July 1, 1903, outstanding liabilities.....	675. 00
	<hr/>
July 1, 1903, balance available.....	36, 705. 43
	<hr/>
{ Amount that can be profitably expended in fiscal year ending June 30, 1905, for maintenance of improvement, in addition to the balance unexpended July 1, 1903.....	
{ Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	
	150, 000. 00

## APPROPRIATIONS.

Act of March 3, 1899:	
For construction of boat .....	\$25, 000
For log booms.....	1, 000
For operating expenses .....	10, 000
Act of June 13, 1902:	
For removal of the water hyacinth from the navigable waters of the States of Florida, Texas, and Louisiana, \$50,000. Allotted for Florida.	25, 000

## Q 10.

### DREDGE FOR RIVER AND HARBOR IMPROVEMENTS, FLORIDA.

See Report of the Chief of Engineers for 1901, pages 1749 and 1750, and current summary, page 280.

Proposals were invited for the construction of the boat and were opened October 16, 1902. The bids were rejected, being too high. The work was readvertised and bids were opened April 17, 1903. Only one bid was received, that of the Merrill-Stevens Engineering Company, of Jacksonville, Fla. The amount of the bid for the boat complete was \$81,254.50. On April 30 the Chief of Engineers authorized the rejection of this bid and the acceptance of a subsequent proposal from the Merrill-Stevens Engineering Company to construct the boat, without the hydraulic dredging apparatus and without the electric and refrigerating equipment, for \$61,404.50.

\* \* \* \* \*

*Money statement.*

July 1, 1902, balance unexpended .....	\$66, 665. 68
June 30, 1903, amount expended during fiscal year .....	880. 25
July 1, 1903, balance unexpended .....	65, 785. 43

## APPROPRIATIONS.

Act of March 3, 1899.....	\$35, 000. 00
Act of June 13, 1902.....	35, 000. 00
Total .....	70, 000. 00

## Q 11.

## REMOVING SUNKEN VESSELS OR CRAFT OBSTRUCTING OR ENDANGERING NAVIGATION.

*Removal of wreck of steamer O. C. Williams, schooner Cottrell, and three scows in Key West Harbor, Florida.*—The steamer *O. C. Williams*, schooner *Cottrell*, and three scows were wrecked on the east and northeast side of Man of War Harbor in about 5 feet of water. The *O. C. Williams* was a steamer about 60 feet long and 18 feet wide. The *Cottrell* was a two-masted schooner about 50 feet long and 10 feet wide. The dimensions of the three scows were as follows: One about 92 by 22 feet, one 66 by 33 feet, and one 110 by 30 feet. These wrecks were in and near the anchorage ground for the sponge fleet, and were dangerous to small boats.

Public notice was given in accordance with the requirements of the act of March 3, 1899. No effort having been made by the owners to remove the wrecks, after advertisement a contract was made with James Owens, of Key West, Fla., to remove the wrecks for \$665. The work was begun May 5, 1903, and was completed June 20, 1903. The wrecks were broken up and all parts placed on the shore.

## CONTRACT IN FORCE DURING THE FISCAL YEAR.

Contractor: James Owens.  
 Work: Removing wrecks from Key West Harbor.  
 Date: March 24, 1903.  
 Approved: April 18, 1903.  
 To be completed: Within sixty days from date of notification.  
 Quantities: To remove steamer *O. C. Williams*, schooner *Cottrell*, and three mud scows for \$665.

## Q 12.

## ESTABLISHMENT OF HARBOR LINES IN ST. JOHNS RIVER AT JACKSONVILLE, FLORIDA.

OFFICE OF THE CHIEF OF ENGINEERS,  
 UNITED STATES ARMY,  
 Washington, July 16, 1902.

SIR: The matter of harbor lines on St. Johns River at Jacksonville, Fla., has been under consideration by the local engineer officers for a



number of years, and in May, 1901, after the great fire of that place, the mayor of Jacksonville made formal application for the establishment of such lines prior to rebuilding the water front. A survey of the locality was necessary preliminary to laying down permanent lines, and as some time must necessarily elapse before said lines could be determined upon, a permit was issued by the Secretary of War July 27, 1901, which sanctioned the construction of a bulkhead along a portion of the river front behind which débris from the burnt district could be dumped.

The required survey was made in September and October, 1901, and report thereon submitted under date of February 17, 1902, from which it will be seen that a public hearing was held and that the harbor lines selected are satisfactory to the local business interests. The lines proposed by the local officer are delineated on the accompanying tracings,<sup>a</sup> and described in a separate paper herewith.

It is recommended that these lines be approved, and that the Secretary place his approval upon both the tracings and description, which have been prepared for his signature.

Very respectfully, your obedient servant,

A. MACKENZIE,  
*Acting Chief of Engineers.*

Hon. ELIHU ROOT,  
*Secretary of War.*

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REPORT OF CAPT. HERBERT DEAKYNE, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,  
*Tampa, Fla., February 17, 1902.*

GENERAL: I have the honor to submit the following report upon the establishment of harbor lines at Jacksonville, Fla., in accordance with orders from the Department dated June 4, 1901:

The survey of the St. Johns River necessary for the establishment of these lines was made in September and October, 1901, by Mr. E. B. Thomson, draftsman, under the direction of Mr. J. W. Sackett, assistant engineer. The survey covered the river from Sadlers Point, 3 miles above, to Point Suarrez, 6 miles below the city. Harbor lines have been located over this entire length of river, although a considerable portion of the shore is now but sparsely settled.

The greatest care was taken in fixing the harbor lines along the city front of Jacksonville. Regard was had to the preservation of ample width for the flow of the river, and at the same time the convenience of the navigation interests were kept in mind. A public meeting, of which ample notice was given, was held in Jacksonville December 18, 1901. The principal business interests concerned in the matter were represented, and all expressed their satisfaction with the lines proposed.

The bulkhead line is placed sufficiently far out into the stream to include all existing bulkheads. The pierhead line along the city front is 400 feet beyond the bulkhead line. This gives a length of pier greater than the length of any of the steamships now plying regularly on the river. Along the principal business portion of the city

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<sup>a</sup> Not printed.

the pierhead line lies between the 18-foot and the 24-foot contours. On the opposite bank, at South Jacksonville, the pierhead line follows approximately the 12-foot contour. The clear width between the pierhead lines is nowhere less than 1,300 feet. This is wide enough to allow easy movement of vessels, and does not reduce the width of the stream sufficiently to cause any anticipation of dangerously strong currents.

In the less important stretches of river above and below Jacksonville the bulkhead line has generally been so located as to connect the projecting points of the shore line, and the pierhead line follows approximately the 12-foot contour, except where this contour lies unusually far from shore.

Three tracings are forwarded. Sheet No. 1 shows the river from Sadlers Point to Hogans Creek; sheet No. 2 shows the river from Hogans Creek to Point Suarez; sheet No. 3<sup>a</sup> shows in tabulated form the description of the harbor lines.

\* \* \* \* \*

Should the location of these lines be approved by the Secretary of War, I would request that the tracings be returned to me for the purpose of making blueprints for interested parties, after which the tracing can be returned to your office for file.

Very respectfully, your obedient servant,

HERBERT DEAKYNE,  
*Captain, Corps of Engineers.*

Brig. Gen. G. L. GILLESPIE,  
*Chief of Engineers U. S. Army.*

DETAILED DESCRIPTION OF THE PIERHEAD AND BULKHEAD LINES FOR THE ST. JOHN RIVER AT, AND IN THE VICINITY OF, JACKSONVILLE, FLA.

[Bearings are referred to true meridian.]

BULKHEAD LINES—RIGHT BANK—SHEET NO. 1.

Commencing at a point near Phillips Point (sometimes known as Point La Vista) whence station Vista bears N. 38° 23' W. 485 feet, and station Mitchell bears N. 19° 47' E. 8,120 feet; thence N. 7° 46' E. 2,225 feet; thence N. 30° 36' E. 3,015 feet; thence N. 63° 10' E. 580 feet; thence along a circular tangential arc of 1,500 feet radius (described from a center whence station Mitchell bears N. 40° 49' E. 1,630 feet, and station Grass bears N. 9° W. 4,925 feet) for a distance of 65° 22' to a point marked "5" on the map; thence along a circular tangential arc of 3,290 feet radius (described from a center whence station Mitchell bears N. 65° 30' E. 3,135 feet, and station Grass bears N. 11° 53' E. 5,035 feet) for a distance of 1° 08' to a point (marked "6" on the map) at the south side of a waterway at the mouth of a creek, whence the bulkhead line on the southerly side of said waterway extends northeasterly in the direction and for the distance shown upon the map. Commencing again on the north side of said waterway at a point (marked "7" upon the map, and situated on the continuation of the last-described arc at a distance of 100 feet from point 6, measured along the chord of the arc) whence the bulkhead line on the northerly side of said waterway extends northeasterly in the direction and for the distance shown upon the map; thence northerly along the continuation of the last-described arc for a distance of 25° 12'; thence (along a tangent) N. 30° 25' W. 2,230 feet; thence N. 59° 35' E. 210 feet to a point (marked "10" upon the map) on the southerly side of a waterway at the mouth of a creek, whence the bulkhead line continues southeasterly along the southerly side of said waterway in the direction and for the distance shown upon the map. Commencing again on the northerly side of said

<sup>a</sup> Not printed; superseded by the description herewith.

waterway at a point (marked "11" upon the map) situated N. 15° W. 50 feet from point 10, and whence the bulkhead line on the northerly side of said waterway extends southeasterly in the direction and for the distance shown upon the map; thence S. 59° 35' W. 220 feet; thence N. 30° 25' W. 2,335 feet; thence along a circular tangential arc of 1,935 feet radius (described from a center whence station Offset bears N. 33° 19' W. 1,935 feet, and station Grass bears S. 34° 13' W. 2,050 feet) for a distance of 57° 52'; thence (along a tangent) N. 27° 26' E. 1,125 feet; thence along a circular tangential arc of 625 feet radius (described from a center whence station Offset bears N. 88° 05' W. 420 feet, and station Custom bears N. 2° 25' E. 3,680 feet) for a distance of 72° 24'; thence (along a tangent) S. 80° 20' E. 1,250 feet; thence S. 77° 17' E. 1,310 feet; thence S. 69° 45' E. 1,775 feet to a point (marked "19" on the map) whence station Merrill bears S. 57° 01' E. 1,140 feet, and station Hardee bears N. 68° 30' E. 3,075 feet.

## BULKHEAD LINES—LEFT BANK—SHEET NO. 1.

Commencing at a point (marked "53" on the map) near the mouth of Hogans Creek, whence the bulkhead line on the west side of Hogans Creek extends northeasterly in the direction and for the distance shown upon the map; thence N. 65° 17' W. 800 feet to a point (marked "54" on the map) whence station Merrill bears S. 26° 00' E. 3,575 feet; thence N. 76° 11' W. 2,990 feet (parallel to and 300 feet from the southerly side of Bay street); thence along a circular tangential arc of 3,220 feet radius (described from a center whence station Custom bears N. 2° 28' E. 4,005 feet, and Station Offset bears N. 49° 49' W. 530 feet) for a distance of 30° 12' to a point (marked "56" upon the map) whence the bulkhead line on the easterly side of McCoys Creek extends northwesterly in the direction and for the distance shown upon the map. Commencing again on the westerly side of McCoys Creek at a point (marked "57" upon the map and situated on a continuation of the last-described arc, at a distance of 100 feet from point 56, measured along the chord of the arc) whence the bulkhead on the westerly side of McCoys Creek extends northwesterly in the direction and for the distance shown upon the map; thence along a continuation westward of the last described arc for a distance of 14° 02'; thence (along a tangent) S. 58° 09' W. 1,805 feet; thence along a circular tangential arc (described from a center whence station West Fender bears N. 22° 57' E. 1,965 feet, and station Offset bears S. 89° 34' E. 1,955 feet) for a distance of 36° 38'; thence (along a tangent) S. 21° 33' W. 3,405 feet (parallel to and 510 feet from the easterly side of Riverside avenue); thence along a circular tangential arc of 395 feet radius (described from a center whence station West Fender bears N. 43° 05' E. 5,765 feet, and station Lancaster bears S. 85° 46' E. 395 feet) for a distance of 51° 44'; thence (along a tangent) S. 73° 32' W. 2,760 feet (parallel to and 550 feet from the southerly side of Riverside avenue); thence S. 58° 03' W. 1,220 feet; thence S. 44° 35' W. 3,070 feet; thence S. 31° 46' W. 4,730 feet; thence S. 16° 10' W. 675 feet to a point (marked "67" on the map) whence station Sadler bears S. 46° 48' E. 2,370 feet, and station Lancaster bears N. 45° 29' E. 12,335 feet.

## BULKHEAD LINES—RIGHT BANK—SHEET NO. 2.

Commencing at point 19, previously described, whence station Merrill bears S. 57° 01' E. 1,140 feet and station Hardee bears N. 68° 30' E. 3,075 feet; thence S. 65° 12' E. 540 feet to a point (marked "20" on the map) situated on the westerly side of a waterway at the mouth of a creek, whence the bulkhead line on the westerly side of said waterway extends southwesterly in the direction and for the distance shown upon the map. Commencing again on the easterly side of said waterway at a point (marked "21" upon the map, and situated S. 65° E. 55 feet from point 20) whence the bulkhead line on the easterly side of said waterway extends southwestwardly in the direction and for the distance shown upon the map; thence S. 59° 39' E. 1,145 feet; thence along a circular tangential arc of 7,050 feet radius (described from a center whence station Commodore bears S. 13° 47' E. 3,725 feet and station Ostrich bears N. 72° 20' E. 1,120 feet) for a distance of 26° 50'; thence along a circular tangential arc of reverse curve and of 710 feet radius (described from a center whence station Commodore bears N. 18° 01' E. 4,335 feet and station Cummings bears N. 71° 31' E. 2,780 feet), for a distance of 39° to a point (marked "24" on the map) at the western side of the mouth of Millers Creek. Commencing again at a point (marked "25" on the map) on the east bank of Millers Creek, and situated S. 87° 38' E. 515 feet from point 24; thence along a circular tangential arc of 230 feet radius (described from a center whence station Cummings bears N. 71° 29' E. 1,520 feet and station Commodore bears N. 2° 22' E. 3,730 feet) for a distance of 50° 00'; thence along a circular tangential arc of reverse curve and of 6,385 feet radius (described from a center whence station Ostrich bears N. 54° 08' E. 2,080 feet and station Commodore bears S. 28° 44' E. 3,125 feet) for a distance of 40° 51'; thence along a

reverse circular tangential arc of 235 feet radius (described from a center whence station Cummings bears S. 51° 18' W. 3,150 feet and station Commodore bears N. 71° 20' W. 3,960 feet) for a distance of 110° to a point (marked "28" on the map) on the southerly bank of the Arlington River. Commencing again at a point (marked "29" on the map) situated N. 41° 04' E. 1,625 feet from point 28, and on the northerly bank of the Arlington River; thence N. 12° 05' W. 420 feet; thence N. 14° 27' E. 1,835 feet; thence N. 3° 21' W. 3,570 feet to station Bigelow; thence N. 8° 13' E. 4,790 feet; thence N. 14° 17' W. 2,315 feet to station Driggs; thence N. 14° 17' W. 6,175 feet to a point (marked "35" on the map) whence station Bank bears S. 29° 40' E. 465 feet, and station Suarez bears S. 27° 18' W. 4,180 feet.

## BULKHEAD LINES—LEFT BANK—SHEET NO. 2.

Commencing at the southwest corner of the Atlantic, Valdosta and Western Railway dock near Six Mile Creek, whence station Suarez bears S. 25° 39' E. 2,175 feet and station Bank bears N. 66° 27' E. 3,380 feet; thence S. 36° 22' E. 1,155 feet; thence along a circular tangential arc of 1,410 feet radius (described from a center whence station Suarez bears S. 82° 00' E. 1,410 feet and station Bank bears N. 48° 48' E. 4,720 feet) for a distance of 44° 18'; thence (along a tangent) S. 8° 02' W. 2,990 feet; thence S. 2° 04' E. 3,190 feet to station Deer; thence S. 4° 51' W. 1,315 feet; thence along a circular tangential arc of 225 feet radius (described from a center whence station Deer bears N. 14° 42' E. 1,330 feet and station Bigelow bears S. 65° 04' E. 4,345 feet) for a distance of 66° 00'; thence (along a tangent) S. 70° 56' W. 460 feet to a point (marked "43" on the map) on the northern side of the mouth of Deer Creek. Commencing again at a point (marked "44" on the map) situated on the southern side of the mouth of Deer Creek and S. 62° 05' W. 105 feet from point 43; thence S. 56° 10' E. 215 feet; thence S. 34° 26' W. 985 feet; thence S. 4° 25' W. 6,350 feet; thence along a circular tangential arc of 265 feet radius (described from a center whence station Commodore bears S. 88° 31' E. 350 feet and station Ostrich bears N. 7° 42' E. 3,990 feet) for a distance of 60° 09'; thence (along a tangent) S. 66° 20' W. 715 feet; thence S. 84° 59' W. 1,785 feet; thence N. 69° 50' W. 1,910 feet; thence N. 65° 17' W. 1,485 feet to a point (marked "52" on the map) at the east side of the mouth of Hogans Creek, whence point 53, previously mentioned, at the western side of the mouth of Hogans Creek, bears N. 65° 17' W. 35 feet, and whence the bulkhead line on the easterly side of Hogans Creek extends northeasterly in the direction and for the distance shown upon the map.

## PIERHEAD LINES—RIGHT BANK—SHEET NO. 1.

Commencing at a point near Phillips Point (sometimes known as Point La Vista) whence station Vista bears N. 12° 15' E. 345 feet and station Mitchell bears N. 22° 10' E. 8,220 feet; thence N. 12° 15' E. 1,970 feet; thence N. 28° 44' E. 4,505 feet; thence along a circular tangential arc of 1,965 feet radius (described from a center whence station Grass bears N. 5° 29' E. 4,435 feet and station Mitchell bears N. 70° 40' E. 2,385 feet) for a distance of 17° 48'; thence (in a straight line) to point 6 of the bulkhead line. Commencing again at point 7 of the bulkhead line; thence (in a straight line) to a point on the continuation northward of the last-described arc, 3° 09' distant from the last-described point on that arc; thence along the continuation northward of that arc, for a distance of 35° 00'; thence (along a tangent) N. 27° 13' W. 2,205 feet; thence (in a straight line) to a point (marked "9" on the map) on the bulkhead line. Commencing again at a point (marked "12" on the map) on the bulkhead line; thence (in a straight line) southwesterly to a point on the continuation of the line (previously described) running N. 27° 13' W., and 50 feet distant from the last-mentioned point on that line; thence N. 27° 13' W. 2,440 feet; thence along a circular tangential arc of 1,900 feet radius (described from a center whence station Grass bears S. 29° 42' W. 1,745 feet and station Offset bears N. 23° 17' W. 1,955 feet) for a distance of 41° 08'; thence (along a tangent) N. 13° 55' E. 1,410 feet; thence along a circular tangential arc of 1,420 feet radius (described from a center whence station Grass bears S. 13° 51' W. 3,095 feet and station Custom bears N. 1° 05' W. 3,965 feet) for a distance of 89° 37'; thence (along a tangent) S. 76° 28' E. 1,665 feet; thence S. 73° 01' E. 1,250 feet; thence along a circular tangential arc of 3,565 feet radius (described from a center whence station Merrill bears N. 56° 00' E. 3,495 feet and station Grass bears S. 85° 34' W. 2,850 feet) for a distance of 16° 45'; thence (along a tangent) S. 56° 16' E. 710 feet; thence (in a straight line) to point 20 of the bulkhead line. Commencing again at point 21 of the bulkhead line; thence northeasterly (in a straight line) to a point on the continuation of the line (previously described) running S. 56° 16' E. and 50 feet distant from the last-described point on that line; thence S. 56° 16' E. 350 feet to a point whence station Merrill bears South 395 feet and station Grass bears S. 65° 57' W. 6,295 feet.

## PIERHEAD LINES—LEFT BANK—SHEET NO. 1.

Commencing at a point near Fish Weir Creek whence station Sadler bears S. 41° 52' E. 2,200 feet, and station Lancaster bears N. 44° 45' E. 12,150 feet; thence N. 31° 46' E. 5,170 feet; thence N. 44° 35' E. 3,675 feet; thence N. 58° 03' E. 455 feet; thence N. 73° 32' E. 2,980 feet; thence N. 21° 33' E. 3,935 feet, thence N. 58° 24' E. 2,490 feet; thence along a circular tangential arc of 3,030 feet radius (described from a center whence station Lancaster bears S. 70° 08' W. 5,480 feet, and station Grass bears S. 10° 32' W. 2,805 feet) for a distance of 14° 41'; thence (in a straight line) to point 57 of the bulkhead line. Commencing again at point 56 of the bulkhead line; thence (in a straight line) to a point on the continuation eastward of the last described arc, 1° 57' distant from the last described point on that arc; thence along a continuation eastward of that arc for a distance of 28° 47'; thence (along a tangent) S. 76° 11' E. 1,845 feet; thence S. 73° 01' E. 1,840 feet; thence (in a straight line) to point 53 of the bulkhead line. Commencing again at point 52 of the bulkhead line; thence southwesterly (in a straight line) to a point on the continuation of the line (previously described) running S. 73° 01' E., 50 feet from the last described point on that line; thence S. 73° 01' E. 770 feet to a point whence station Merrill bears S. 5° E. 2,325 feet, and station Offset bears S. 77° 46' W. 5,575 feet.

## PIERHEAD LINES—RIGHT BANK—SHEET NO. 2.

Commencing at the last described point on the pierhead line for the right bank, Sheet No. 1; thence S. 59° 53' E. 840 feet; thence along a circular tangential arc of 6,395 feet radius (described from a center whence station Commodore bears S. 18° 30' E. 3,445 feet and station Ostrich bears N. 61° 29' E. 1,450 feet) for a distance of 31° 33'; thence (in a straight line) to point 24 of the bulkhead line. Commencing again at point 25 of the bulkhead line; thence (in a straight line) to a point on the continuation eastward of the last described arc, 4° 39' distant from the last described point on that arc; thence along a continuation eastward of that arc for a distance of 2° 20'; thence along a circular tangential arc of 5,410 feet radius (described from a center whence station Commodore bears S. 22° 35' E. 2,480 feet, and station Ostrich bears N. 34° 02' E. 2,020 feet) for a distance of 45° 33'; thence along a circular tangential arc of 8,310 feet radius (described from a center whence station Commodore bears S. 39° 40' E. 5,180 feet, and station Ostrich bears S. 89° 24' E. 3,480 feet) for a distance of 2° 19'; thence (in a straight line) to point 28 of the bulkhead line. Commencing again at point 29 of the bulkhead line; thence (in a straight line) to a point on the continuation northward of the last described arc, distant 8° 07' from the last described point on that arc; thence along a continuation northward of that arc for a distance of 24° 29'; thence (along a tangent) N. 1° 07' E. 8,015 feet; thence N. 10° 01' W. 3,375 feet; thence N. 18° 46' W. 3,720 feet to a point whence station Bank bears S. 67° 56' E. 670 feet and station Suarez bears S. 23° 08' W. 3,875 feet.

## PIERHEAD LINES—LEFT BANK—SHEET NO. 2.

Commencing at the last described point on the pierhead line for the left bank, Sheet No. 1; thence S. 61° 56' E. 2,040 feet; thence along a circular tangential arc of 3,230 feet radius (described from a center whence station Commodore bears S. 43° 53' E. 2,720 feet, and station Ostrich bears N. 46° E. 2,880 feet) for a distance of 48° 53'; thence along a circular tangential arc of 2,070 feet radius (described from a center whence station Commodore bears S. 59° 13' E. 1,715 feet, and station Hardee bears S. 49° 42' W. 2,140 feet) for a distance of 69° 03'; thence (along a tangent) N. 0° 08' E. 4,800 feet; thence along a circular tangential arc of 1,875 feet radius (described from a center, whence station Root bears S. 38° 34' E. 4,730 feet, and station Ostrich bears S. 53° 29' W. 2,875 feet) for a distance of 48° 28'; thence (in a straight line) to point 44 of the bulkhead line. Commencing again at point 43 of the bulkhead line; thence (in a straight line) to a point situated N. 48° 20' E. 85 feet from the last described point on the last described arc; thence N. 48° 20' E. 405 feet; thence N. 13° 30' E. 4,640 feet; thence along a circular tangential arc of 5,175 feet radius (described from a center, whence station Suarez bears N. 64° 57' E. 4,625 feet, and station Deer bears S. 42° 52' E. 5,710 feet) for a distance of 63° 50' to a point whence station Bank bears N. 67° E. 3,300 feet, and station Driggs bears S. 45° 15' E. 6,090 feet.

WAR DEPARTMENT.

July 22, 1902.

Approved

E. ROOT,  
Secretary of War.

## APPENDIX R.

### IMPROVEMENT OF RIVERS AND HARBORS ON THE WESTERN COAST OF FLORIDA, SOUTH OF AND INCLUDING SUWANEE RIVER.

*REPORT OF CAPT. FRANCIS R. SHUNK, CORPS OF ENGINEERS,  
OFFICER IN CHARGE, FOR THE FISCAL YEAR ENDING JUNE 30,  
1903, WITH OTHER DOCUMENTS RELATING TO THE WORKS.*

#### IMPROVEMENTS.

- |  |  |
|--|--|
| 1. Kissimmee River, Florida.   | 4. Tampa Bay, Florida.   |
| 2. Orange River, Charlotte Harbor, and<br>Caloosahatchee River, Florida. | 5. Hillsboro Bay, Florida.   |
| 3. Sarasota Bay, Florida.  | 6. Crystal, Manatee, Anclote, Suwanee,<br>and Withlacoochee rivers, Florida. |

UNITED STATES ENGINEER OFFICE,  
*Jacksonville, Fla., July 20, 1903.*

GENERAL: I have the honor to submit herewith annual reports upon the works of river and harbor improvement, west coast, Florida, for the fiscal year ending June 30, 1903.

Very respectfully, your obedient servant,

FRANCIS R. SHUNK,  
*Captain, Corps of Engineers.*

Brig. Gen. G. L. GILLESPIE,  
*Chief of Engineers, U. S. A.*

#### R 1.

#### IMPROVEMENT OF KISSIMMEE RIVER, FLORIDA.

For project, description, etc., see summary, page 281.

The river and harbor act of June 13, 1902, appropriated \$8,000 for improving Kissimmee River, Florida.

A project for expenditure of available funds was submitted July 18, 1902, and approved December 2, 1902.

Preliminary work was begun January 2, 1903. Material was purchased and a plant improvised for dredging and bulkhead work. A lighter was constructed on which the necessary machinery was installed, and quarters built for the force employed. The dredge, called the *Kissimmee*, was completed in March, 1903. Actual work of improving the waterway was commenced April 2, 1903, at a shoal in Southport Canal (between Lake Tohopekaliga and Cypress Lake) near the

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middle point of its length. To confine the channel a sheet piling bulkhead 2,960 feet long was constructed on the westerly side of the canal. Dredging commenced June 2, 1903, and at the end of the fiscal year there had been removed a total of 4,094 cubic yards of sand.

The new channel is not yet available for shipping, because the cut is not completed. The cut is being dredged 30 feet wide and 4 feet deep at ordinary stage of the canal.

## Money statement.

July 1, 1902, balance unexpended .....	\$8,000.00
June 30, 1903, amount expended during fiscal year .....	4,980.17
July 1, 1903, balance unexpended .....	3,019.83
July 1, 1903, outstanding liabilities .....	650.00
July 1, 1903, balance available .....	2,369.83
(Amount (estimated) required for completion of existing project.....	16,220.90
Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903:	
For works of improvement.....	\$16,220.90
For maintenance of improvement .....	1,000.00
	17,220.90
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

## APPROPRIATION.

June 13, 1902 .....	\$8,000
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## COMMERCIAL STATISTICS.

### Commerce of Kissimmee River for the year ending December 31, 1902.

[Compiled from information furnished by Capt. Clay Johnson, Kissimmee, Fla.]

Articles.	Gross tonnage.	Articles.	Gross tonnage.
Cattle.....	5,500	Hides.....	380
Coal.....	500	Honey, sirup, etc.....	10
Fertilizers (including phosphates).....	50	Lumber (rough and dressed).....	400
Fish.....	300	Merchandise.....	500
Fruit (excluding oranges).....	50	Oranges.....	800
Grain.....	500	Vegetables.....	625
Hay.....	25	Wool.....	15

Number steamboats in trade .....	5
Number passengers carried in 1902 .....	1,900

## R 2.

### IMPROVEMENT OF ORANGE RIVER, CHARLOTTE HARBOR, AND CALOOSAHATCHEE RIVER, FLORIDA.

These improvements were combined under one appropriation by the following item of the river and harbor act of June 13, 1902:

Improving Orange River, Florida, in accordance with report submitted in House Document Numbered Three hundred and eighteen, Fifty-sixth Congress.

first session, Charlotte Harbor and Caloosahatchee River, Florida, from Puntarasa to Punta Gorda, in accordance with the report submitted in House Document Numbered Two hundred and eighty-six, Fifty-sixth Congress, first session, nine thousand five hundred dollars, of which so much as may be necessary may be expended between Puntarasa and Fort Thompson.

On October 22, 1902, the following allotment of available funds was approved:

To Orange River .....	\$2,000
To Charlotte Harbor and Caloosahatchee River, between Puntarasa and Punta Gorda .....	6,000
To Caloosahatchee River, between Puntarasa and Fort Thompson .....	1,500

(a) ORANGE RIVER.

See summary, page 282, and Report of the Chief of Engineers for 1900, pages 2032-2040.

The U. S. dredge and snag boat *Suwanee* began work in Orange River on May 11, 1903, and completed the improvement on June 8, 1903. A total of 2,626.1 cubic yards of soft material was dredged, 215 snags removed, and 170 overhanging trees trimmed.

(b) CHARLOTTE HARBOR AND CALOOSAHATCHEE RIVER, FROM PUNTARASA TO PUNTA GORDA, FLORIDA.

See summary, page 282, and Report of the Chief of Engineers for 1900, pages 2033-2036.

The *Suwanee* commenced operations at the shoal northeastward of Patricio Island on April 13, 1903, and up to May 5, 1903, removed a total of 4,784.4 cubic yards of soft material. The cut formed is 1,500 feet long, 50 feet wide, and 8 feet deep at mean low water level. On May 5, 1903, the *Suwanee* proceeded to Blind Pass shoal in Pine Island Sound. A gale prevented dredging operations, and as the supply of fuel was uncertain the *Suwanee* on May 7, 1903, proceeded to Orange River.

(c) CALOOSAHATCHEE RIVER, BETWEEN PUNTARASA AND FORT THOMPSON.

See summary, page 283, and Reports of the Chief of Engineers for 1896, pages 1327 and 1328, and for 1898, page 1334.

The *Suwanee* began work of maintenance in the Caloosahatchee River on June 9, 1903. During the fiscal year ending June 30, 1903, there were removed from the river 213 snags, and 151 overhanging trees were trimmed.

*Money statement.*

July 1, 1902, balance unexpended .....	\$9,500.00
June 30, 1903, amount expended during fiscal year .....	2,715.60
July 1, 1903, balance unexpended .....	6,784.40
July 1, 1903, outstanding liabilities .....	1,000.00
July 1, 1903, balance available .....	5,784.40
<div> <div> Amount that can be profitably expended in fiscal year ending June 30, 1905, for maintenance of improvement, in addition to the balance unexpended July 1, 1903 </div> <div> Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899. </div> </div>	
	2,000.00



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## *Appropriations for improvement of Calcosahatchee River, Florida.*

August 2, 1882.....	\$5,000	August 18, 1894.....	\$2,000
July 5, 1884.....	5,000	June 3, 1896.....	1,000
August 5, 1886.....	4,000	March 3, 1899.....	2,000
August 11, 1888.....	10,000		
September 19, 1890.....	8,600	Total appropriated.....	33,600
July 13, 1892.....	1,000	Expenditures to June 30, 1903..	33,600

## *Appropriations for improvement of Charlotte Harbor and Peace Creek, Florida.*

September 19, 1890.....	\$35,000	March 3, 1899.....	\$25,000
August 18, 1894.....	20,000		
June 3, 1896.....	20,000	Total appropriated.....	100,000
		Expenditures to June 30, 1903..	100,000

## *Appropriation for improvement of Orange River, Charlotte Harbor, and Calcosahatchee River, Florida.*

June 13, 1902.....	\$9,500
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## COMMERCIAL STATISTICS.

### *Commerce of Orange River for the year ending December 31, 1902.*

[Compiled from information furnished by the Fort Myers Board of Trade.]

Articles.	Gross tonnage.	Articles.	Gross tonnage.
Fertilizers (including phosphates)....	500	Merchandise.....	3,000
Fruit (excluding oranges).....	250	Oranges.....	1,400
Grain.....	30	Vegetables.....	250
Hay.....	1,500	Total.....	7,155
Honey, sirup, etc.....	25		
Lumber (rough and dressed).....	200		

Number of steamboats in trade.....	1
Number of passengers carried in 1902.....	1,200

### *Commerce of Charlotte Harbor for the year ending December 31, 1902.*

[Compiled from information furnished by Mr. A. F. Dewey, of Punta Gorda, Fla.]

Articles.	Gross tonnage.	Articles.	Gross tonnage.
Cattle.....	2,582	Honey, sirup, etc.....	88
Coal.....	29,400	Lumber (rough and dressed).....	1,800
Fertilizers (including phosphates)....	8,570	Merchandise.....	20,810
Fish.....	1,830	Oranges.....	4,788
Fruit (excluding oranges).....	1,197	Vegetables.....	4,050
Grain.....	1,023	Oysters.....	8
Hay.....	1,800	Total.....	78,264
Hides.....	228		

Number of steamboats in trade.....	6
Number sailing vessels in trade.....	13
Number passengers carried in 1902.....	13,444

*Commerce of Caloosahatchee River for the year ending December 31, 1902.*

[Compiled from information furnished by the Fort Myers Board of Trade.]

Articles.	Gross tonnage.	Articles.	Gross tonnage.
Cattle .....	550	Lumber (rough and dressed) .....	2,500
Coal .....	0	Merchandise .....	11,000
Fertilizers (including phosphates) .....	1,500	Oranges .....	2,600
Fish .....	45	Oysters .....	40
Fruit (excluding oranges) .....	1,000	Resin .....	15
Grain .....	125	Turpentine .....	15
Hay .....	4,000	Vegetables .....	2,000
Hides .....	380	Total .....	27,895
Honey, sirup, etc. ....	125		

Number steamboats in trade .....	21
Number sailing vessels in trade .....	23
Number passengers carried in 1902 .....	5,814

## R 3.

## IMPROVEMENT OF SARASOTA BAY, FLORIDA.

For description, project, and results attention is invited to the Report of the Chief of Engineers for 1896, Part II, pages 1331 and 1332, and 1900, Part III, pages 2018 and 2019, and for 1902, pages 1218 and 1219.

The river and harbor act of June 13, 1902, appropriated \$5,000 for "Improving Sarasota Bay, Florida: Continuing improvement, and for maintenance."

A project for expenditure of the available funds was submitted on July 26, 1902, and was approved July 30, 1902.

The project contemplates extending the cuts in Little Sarasota Bay and maintaining existing channels in Sarasota and Little Sarasota bays.

Operations were commenced by the U. S. snagboat *Suwanee* on November 7, 1902, and were completed on March 4, 1903. A total of 33,952.2 cubic yards of soft material was removed. In the cuts of Little Sarasota Bay 29,528 cubic yards were removed from "The Mangroves" to White Beach shoal, and 4,424.2 cubic yards were removed from the cuts in Sarasota Bay. The result is a continuous channel 50 feet wide and 6 feet deep at mean low-water level from the northerly entrance to Sarasota Bay to the town of Sarasota, Fla., and a cut 50 feet wide and 4 feet deep at mean low-water level from Sarasota town to the village of Osprey.

*Money statement.*

July 1, 1902, balance unexpended .....	\$5,000.00
June 30, 1903, amount expended during fiscal year .....	4,946.20
July 1, 1903, balance unexpended .....	53.80
{ Amount (estimated) required for completion of existing project .....	32,500.00
{ Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903 .....	32,500.00
{ Submitted in compliance with requirements of sundry civil act of June 4, 1897.	

# 1198 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

## APPROPRIATIONS.

September 19, 1890.....	\$5,000.00	June 13, 1902.....	\$5,000.00
July 13, 1893.....	2,500.00		
August 18, 1894.....	2,500.00	Total appropriated....	22,500.00
June 3, 1896.....	2,500.00	Expended to June 30, 1903....	22,446.20
March 3, 1899.....	5,000.00		
		Balance.....	58.80

## COMMERCIAL STATISTICS.

*Commerce of Sarasota Bay, Florida, for the year ending December 31, 1902.*

[Compiled from information furnished by the Sarasota Board of Trade.]

Articles.	Gross tonnage.	Articles.	Gross tonnage.
Fertilizers (including phosphates).....	250	Oranges.....	1,200
Fish.....	1,500	Oysters.....	40
Fruit (excluding oranges).....	75	Resin.....	225
Grain.....	300	Turpentine.....	75
Hay.....	200	Shingles.....	9
Hides.....	2	Vegetables.....	125
Honey, sirup, etc.....	2		
Lumber (rough and dressed).....	60	Total.....	4,318
Merchandise.....	250		

Number of steamboats in trade.....	3
Number of sailing vessels in trade.....	12
Number of passengers carried in 1902.....	4,000

## R 4.

### IMPROVEMENT OF TAMPA BAY, FLORIDA.

For description, project, and results, attention is invited to summary and to Report of the Chief of Engineers for 1899, pages 1632-1635; Report of the Chief of Engineers for 1900, pages 2022-2025, and Report of the Chief of Engineers for 1902, pages 1219-1221.

The channel to be dredged is divided into sections determined by changes of direction and intervening deep-water reaches. The sections are lettered consecutively from the Gulf to Port Tampa. Section A is on the bar. Sections B, C, and D are in the lower bay, E and F are at "The Narrows," G and H lead from the deep basin south of old Tampa Bay to the old south cut, and sections J and K are the old south and north cuts, respectively, near Port Tampa.

During the fiscal year ending June 30, 1903, the work was continued under the continuing contract of August 5, 1899, with the Alabama Dredging and Jetty Company. There were removed 530,176.5 cubic yards of soft material in Tampa Bay and 154,807.3 cubic yards on the bar at North Channel entrance to the bay.

The quantities dredged in the channel sections above the mean low-water depth of 28 feet during the fiscal year ending June 30, 1903, are as follows:

	Cubic yards.
Section A.....	154,807.3
Section B.....	111,709.3
Section C.....	221,775.5
Section D.....	0.0

	Cubic yards.
Section E .....	41,926.2
Section F .....	149,353.4
Section G .....	0.0
Section H .....	0.0
Section J .....	5,412.1
Section K .....	0.0
Total .....	684,983.8

At the close of the fiscal year ending June 30, 1903, seven of the dredged channel sections had the following mean low-water depths for the widths given:

Section.	Depth.	Width.
	<i>Feet.</i>	<i>Feet.</i>
A .....	24	300
B .....	25	300
C .....	27	275
E .....	24	300
F .....	24	72
J .....	24	128
K .....	24	300

From the beginning the work on this contract has been considerably less than the quantity required by the contract. There should have been removed, in round numbers, to June 30, 1903, a total of 3,542,000 cubic yards; the amount actually removed is 2,027,500.4 cubic yards. The causes of delay have been inefficiency of dredges and the dilapidated condition of towboats, scows, and dredges.

*Money statement.*

July 1, 1902, balance unexpended .....	\$251,044.19
Amount appropriated by sundry civil act approved March 3, 1903 .....	186,837.76
	<u>437,881.95</u>
June 30, 1903, amount expended during fiscal year .....	81,063.37
	<u>356,818.58</u>
July 1, 1903, balance unexpended .....	356,818.58
July 1, 1903, outstanding liabilities .....	24,000.00
	<u>332,818.58</u>
July 1, 1903, balance available .....	332,818.58
July 1, 1903, amount covered by uncompleted contracts .....	293,124.46

APPROPRIATIONS.

*Under previous projects.*

By act of—	
June 14, 1880 .....	\$10,000.00
March 3, 1881 .....	10,000.00
August 2, 1882 .....	20,000.00
July 5, 1884 .....	20,000.00
August 5, 1886 .....	10,000.00
August 11, 1888 .....	25,000.00
September 19, 1890 .....	25,000.00
July 13, 1892 .....	10,000.00
Total appropriated for previous projects .....	<u>130,000.00</u>

## 1200 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

### Expended:

On channel from Tampa through Hillsboro River and Bay .....	\$80,000.00
In dredging bars at entrance of old Tampa Bay .....	50,000.00
Expended on previous projects .....	130,000.00

### Under present project.

#### By act of—

March 3, 1899 .....	\$75,000.00
June 6, 1900 .....	135,000.00
March 3, 1901 .....	127,000.00
June 28, 1902 .....	86,875.00
March 3, 1903 .....	186,337.76

### CONTRACT IN FORCE.

Contractors: Alabama Dredging and Jetty Company, Mobile, Ala.

Work: Dredging in Tampa Bay and on the bar at the entrance to Tampa Bay, Florida.

Date of approval: September 22, 1899.

Work began: August 3, 1899.

To be completed: Continuing contract.

### COMMERCIAL STATISTICS.

*Commerce of Tampa Bay, Florida, for the year ending December 31, 1903.*

[Compiled from information furnished by the Atlantic Land and Improvement Company.]

Articles.	Gross tonnage.	Articles.	Gross tonnage.
Tobacco .....	2,308	Lumber (rough and dressed) .....	2,527
Cattle .....	8	Merchandise .....	4,088
Coal .....	24,063	Oranges .....	408
Fertilizers (including phosphates) .....	410,728	Resin .....	6,416
Fish .....	202	Turpentine .....	4,838
Fruit (excluding oranges) .....	241	Vegetables .....	1,701
Grain .....	181	Oil .....	4,978
Hay .....	30		
Hides .....	1	Total .....	462,708

Number steamboats cleared .....	745
Number steamships and sailing vessels cleared .....	448
Number of passengers carried in 1902 .....	33,352

### R 5.

### IMPROVEMENT OF HILLSBORO BAY, FLORIDA.

For description, projects, and results see summary and Report of the Chief of Engineers for 1899, and pages 2025 to 2027, Part III of the Report for 1900, and pages 1222 and 1223 of the Report for 1902.

The river and harbor act of June 13, 1902, contained an appropriation of \$150,000 for continuing the improvement. A project was submitted June 28, 1902, for the expenditure of this amount in widening the existing 12-foot channel by dredging and was approved July 5, 1902.

The proposals for widening the 12-foot channel to 200 feet in the

river and 150 feet in the bay were asked for by advertisement dated August 15, 1902, and were opened September 15, 1902.

A contract was entered into October 13, 1902, with the lowest bidder, Mr. Edwin W. Preston, Tampa, Fla., for dredging 370,000 cubic yards, more or less, of soft material, at  $18\frac{1}{2}$  cents per cubic yard, and for removing 18,000 cubic yards of rock, more or less, at \$4.89 per cubic yard, from a channel 12 feet deep, mean low-water level, 150 feet wide in the bay and 200 feet wide in the river, extending from Lafayette Street Bridge (crossing Hillsboro River at Tampa) to the 12-foot contour in Hillsboro Bay, the westerly side of the channel sections being given a slope of 1 vertical to 3 horizontal.

The contractor commenced work October 7, 1902, and during the fiscal year ending June 30, 1903, dredged 222,183.4 cubic yards of soft material, and blasted and removed 13,776.16 cubic yards of rock, place measurement.

There is money enough appropriated to complete the project for improving Hillsboro Bay. \* \* \* When depths were plotted on the detail sheets and computation made of material to be removed, the quantity of rock was found to be about 15 per cent less than had been computed from the general map when the original estimate was prepared. \* \* \*

*Money statement.*

July 1, 1902, balance unexpended.....	\$159,292.87
June 30, 1903, amount expended during fiscal year.....	97,902.41
July 1, 1903, balance unexpended.....	61,390.46
July 1, 1903, outstanding liabilities.....	11,000.00
July 1, 1903, balance available.....	50,390.46
July 1, 1903, amount covered by uncompleted contracts.....	45,510.64
Amount that can be profitably expended in fiscal year ending June 30, 1905, for maintenance of improvement, in addition to the balance unexpended July 1, 1903.....	2,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

APPROPRIATIONS.

A list of appropriations made for previous projects in this locality are given in the report for the improvement of Tampa Bay in the Annual Report of the Chief of Engineers for 1899, page 1634.

Under present project, by act of March 3, 1899.....	\$125,000.00
Under present project, by act of June 13, 1902.....	150,000.00
	275,000.00
Total expended.....	213,609.54
Balance unexpended June 30, 1903.....	61,390.46

CONTRACT IN FORCE.

Contractor: Edwin W. Preston, Tampa, Fla.  
 Work: Dredging and removal of rock, Hillsboro bay and river, Florida.  
 Date of approval: November 15, 1902.  
 Work began: October 7, 1902.  
 To be completed: September 19, 1903.

# 1202 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

## COMMERCIAL STATISTICS.

*Commerce of Hillsboro Bay, Florida, for the year ending December 31, 1902.*

[Compiled from information furnished by the Tampa Board of Trade.]

Articles.	Gross tonnage.	Articles.	Gross tonnage.
Brick .....	2,500	Naval stores .....	5,780
Building materials (excluding brick) .....	1,387	Oranges .....	8,400
Canned goods .....	3,375	Other fruits .....	1,775
Cattle .....	4,360	Oysters .....	385
Coal .....	3,500	Shingles .....	3,000
Fertilizers .....	12,350	Sidewalk material .....	19,370
Crate materials .....	1,350	Soap, starch, etc .....	2,125
Fish .....	3,057	Sugar .....	1,438
Fuller's earth .....	1,810	Timber .....	7,200
Grain .....	38,011	Tropical fruits (in bulk) .....	2,350
Hay .....	9,500	Vegetables .....	6,500
Hides .....	271	Wood and boiler fuel .....	6,450
Honey, sirup, etc .....	100		
Lumber (rough and dressed) .....	8,500	Total .....	169,844
Merchandise not specified .....	15,000		

Number steamboats in trade ..... 12  
 Number of sailing vessels in trade ..... " 80  
 Number of passengers carried in 1902 ..... 16,000

" Does not include fishing sharples.

## R 6.

### IMPROVEMENT OF CRYSTAL, MANATEE, ANCLOTE, SUWANEE, AND WITHLACOOCHEE RIVERS, FLORIDA.

These improvements were consolidated by the following item of the act of June 13, 1902:

Improving Crystal, Manatee, Anclote, Suwanee, and Withlacoochee rivers, Florida: Continuing improvement and for maintenance, thirty-five thousand dollars, and the further sum of fifteen thousand dollars, to be used in deepening the channel from the mouth of the Withlacoochee River to the loading pool in the Gulf of Mexico, being a distance of eleven thousand seven hundred and eighty feet, to the depth of 8 feet, and to straighten said channel where the same is crooked, and for the maintenance of said channel.

On October 18, 1902, the following allotment of funds was approved:

Crystal River .....	\$10,000
Anclote River .....	10,000
Manatee River .....	2,342
Suwanee River .....	7,658
Withlacoochee River (old project) .....	5,000

There was also available a balance of \$420.85 from a former appropriation for improving the Withlacoochee River. This sum was reallocated to the improvement of Withlacoochee River (old project), making the total allotment for that work \$5,420.85.

#### (a) CRYSTAL RIVER.

See summary, page 286, and Report of the Chief of Engineers for 1900, pages 2075-2078.

A project for expenditure of available funds was approved October 24, 1902.

No work has been done.

*(b) MANATEE RIVER.*

See summary, page 287, and Reports of the Chief of Engineers for 1896, pages 1332 and 1333; for 1900, pages 2020 and 2021, and for 1902, page 1223.

A project for expenditure of available funds was approved October 24, 1892. It provides for maintenance of existing channels in the river and Terraceia Cut-off.

Operations were begun on October 2, 1902, by the U. S. dredge and snagboat *Suwanee*. The work was completed November 6, 1902. Seventeen thousand one hundred and forty-four cubic yards of sand and shell, place measurement, were removed from Terraceia Cut-off, giving a depth of 6.5 feet at mean low water.

*(c) ANCLOTE RIVER.*

See summary, page 287 and Reports of the Chief of Engineers for 1895, pages 1573–1576; for 1898, pages 1361–1363; for 1900, pages 2028 and 2029, and for 1902, page 1223.

A project for expenditure of available funds was approved October 24, 1902. It provides for dredging between Anclothe anchorage and Sponge Harbor.

No work was done.

*(d) SUWANEE RIVER.*

See summary, page 288, and Reports of the Chief of Engineers for 1896, pages 1335–1336; for 1898, pages 1341–1342, and for 1902, pages 1223 and 1224.

A project for expenditure of available funds was approved October 24, 1902. It provides for dredging at the entrance, and removal of shoals and other obstructions in the upper river.

No work was done.

*(e) WITHLACOOCHIEE RIVER.*

See summary, page 288, and Reports of the Chief of Engineers for 1898, pages 1340, 1341, and 1363–1369, and for 1902, page 1224.

A project for expenditure of available funds was approved October 24, 1902. It provides for maintaining the channels obtained under the old project, for making a survey, and for dredging the channel called for by the new project to its full length and depth and to such width as the funds will allow.

No work was done under the old project.

Under the new project the survey was made January 9–20, 1903. Estimates were made for a channel 60 feet wide.

*Money statements.*

## SPECIAL FOR WITHLACOOCHIEE RIVER.

July 1, 1902, balance unexpended.....	\$15,000.00
June 30, 1903, amount expended during fiscal year.....	499.32
July 1, 1903, balance unexpended.....	14,500.68

{ Amount that can be profitably expended in fiscal year ending June 30, 1905, for maintenance of improvement, in addition to the balance unexpended July 1, 1903 .....		1,000.00
{ Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.		



# 1204 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

## CONSOLIDATED APPROPRIATION.

July 1, 1902, balance unexpended .....	\$35,411.83
June 30, 1903, amount expended during fiscal year .....	5,653.82
July 1, 1903, balance unexpended .....	29,757.51
Amount (estimated) required for completion of existing project .....	183,805.46
Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903:	
For works of improvement .....	\$133,305.46
For maintenance of improvement .....	5,000.00
	188,805.46
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

## APPROPRIATIONS.

### Manatee River.

August 2, 1882 .....	\$12,000	August 18, 1894 .....	\$3,000
August 5, 1886 .....	11,000	June 3, 1896 .....	<sup>a</sup> 4,000
August 11, 1888 .....	5,000	March 3, 1899 .....	<sup>b</sup> 10,000
September 19, 1890 .....	6,000		
July 13, 1892 .....	6,000	Total .....	57,000
<sup>a</sup> Includes \$3,000 for Terraceia Cut-off.		<sup>b</sup> Includes \$8,000 for Terraceia Cut-off.	

### Anclote River.

March 3, 1899 .....	\$5,000
---------------------	---------

### Withlacoochee River.

March 3, 1881 .....	\$7,500	August 18, 1894 .....	\$800
July 5, 1884 .....	3,000	June 13, 1902 .....	15,000
August 5, 1886 .....	3,000		
August 11, 1888 .....	5,000	Total .....	39,700
September 19, 1890 .....	5,400		

### Suwanee River.

June 14, 1880 .....	\$5,000	July 13, 1892 .....	\$3,000
March 3, 1881 .....	3,000	August 18, 1894 .....	3,000
August 2, 1882 .....	5,000	June 3, 1896 .....	3,000
July 5, 1884 .....	5,000	March 3, 1899 .....	5,000
August 5, 1886 .....	5,000		
August 11, 1888 .....	15,000	Total .....	55,000
September 19, 1890 .....	3,000		

### Crystal, Manatee, Anclote, Suwanee, and Withlacoochee rivers.

June 13, 1902 .....	\$35,000
---------------------	----------

## COMMERCIAL STATISTICS.

### Commerce of Crystal River for the year ending December 31, 1902.

[Compiled from information furnished by Mr. C. E. Herrick, Crystal River, Florida.]

Articles.	Gross tonnage.
Fish .....	750
Lumber (rough and dressed) .....	500
Oysters .....	400
Resin .....	75
Turpentine .....	60
Total .....	1,785

Number of steamboats in trade .....	2
Number of sailing vessels in trade .....	1

*Commerce of Manatee River for the year ending December 31, 1902.*

[Compiled from information furnished by the Manatee River Board of Trade at Palmetto, Fla.]

Articles.	Gross tonnage.	Articles.	Gross tonnage.
Cattle.....	537	Resin.....	950
Coal.....	300	Turpentine.....	310
Fuel oil.....	1,500	Vegetables.....	11,084
Fuller's earth.....	5,000	Total.....	34,495
Merchandise.....	8,868		
Oranges.....	8,086		

*Commerce of Withlacoochee River for the year ending December 31, 1902.*

[Compiled from information furnished by Mr. John L. Inglis, president of the Dunnellon Phosphate Company.]

Articles.	Gross tonnage.	Articles.	Gross tonnage.
Coal.....	425	Merchandise.....	32
Cedar.....	44	Oysters.....	5
Fertilizers (including phosphates).....	70,470	Wood.....	2,943
Fish.....	8	Total.....	74,047
Lumber (rough and dressed).....	120		

Number of steamboats in trade.....	8
Number of sailing vessels in trade.....	2
Number of passengers carried in 1902.....	730

NOTE.—Statistics for Anclote River and for Suwanee River could not be obtained.



## APPENDIX S.

### IMPROVEMENT OF RIVERS AND HARBORS IN WESTERN GEORGIA AND FLORIDA AND IN EASTERN ALABAMA.

REPORT FOR THE FISCAL YEAR ENDING JUNE 30, 1903, WITH OTHER  
DOCUMENTS RELATING TO THE WORKS. OFFICERS IN CHARGE,  
CAPT. R. R. RAYMOND AND CAPT. J. B. CAVANAUGH, CORPS OF  
ENGINEERS.

#### IMPROVEMENTS.

- |  |   |
|--|---|
| 1. Carrabelle Bar and Harbor, Florida.   | 9. Pensacola Harbor, Florida.   |
| 2. Apalachicola Bay, Florida.  | 10. Escambia and Conecuh rivers, Florida and Alabama.   |
| 3. Apalachicola River, the Cut-off, and Lower Chipola River, Florida.                  | 11. Alabama River, Alabama.   |
| 4. Upper Chipola River, Florida, from Marianna to its mouth.                           | 12. Coosa, Oostenaula, and Coosawattee rivers, Georgia and Alabama.                                 |
| 5. Flint River, Georgia.   | 13. Operating and care of canals and other works of navigation on Coosa River, Georgia and Alabama. |
| 6. Chattahoochee River, Georgia and Alabama.   | 14. Removing sunken vessels or craft obstructing or endangering navigation.                         |
| 7. Choctawatchee River, Florida and Alabama.   |   |
| 8. Lagrange Bayou, Florida, including Holmes River, Florida, from Vernon to its mouth. |   |

UNITED STATES ENGINEER OFFICE,  
*Montgomery, Ala., July 20, 1903.*

GENERAL: I have the honor to forward herewith \* \* \* annual reports of the river and harbor works under my charge \* \* \* for the fiscal year ending June 30, 1903.

\* \* \* \* \*

Very respectfully, your obedient servant,

J. B. CAVANAUGH,  
*Captain, Corps of Engineers.*

Brig. Gen. G. L. GILLESPIE,  
*Chief of Engineers, U. S. A.*

#### S 1.

### IMPROVEMENT OF EAST PASS CARRABELLE BAR AND HARBOR, FLORIDA.

A description of the locality, its original condition, the projects for improvement, the recommendations resulting from recent examinations and surveys, and the present condition of the channel across

# 1208 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

the bar at the river mouth and at East Pass are stated in the Annual Report of the Chief of Engineers for 1903, page 290.

Work done prior to June 30, 1900, will be found described on pages 2088-2089, Annual Report of the Chief of Engineers for 1900.

## OPERATIONS DURING THE FISCAL YEAR ENDING JUNE 30, 1903.

Proposals for dredging across East Pass were opened on April 4, 1903. The only bid received was that made by Mr. Rittenhouse Moore, of Mobile, Ala., at 30 cents per cubic yard. This bid was rejected on account of bidder's insufficient plant. \* \* \*

It is proposed to expend the balance available in dredging the channel at East Pass, the work to be done by contract, and to apply the additional appropriation recommended to deepening East Pass and closing an opening on Dog Island, and to dredging a channel 10 feet deep across this bar at the mouth of the Carrabelle River.

## RECOMMENDATIONS AND ESTIMATES.

The completion of work upon the bar at the river mouth and the deeping of East Pass are important to both present and prospective commerce. The vessels now touching at Carrabelle and the tugs used in lightering between Carrabelle and St. George anchorage find the narrow, shallow channel very difficult of navigation, and relief is badly needed. The increased depth of water through East Pass will secure much better rates of freight and insurance for the commerce now using Carrabelle Harbor, and much better inducements will be offered to prospective commerce. I am informed that greatly increased railroad facilities and largely increased commerce are dependent almost solely upon the improvement of the harbor and channel.

The channel across the bar at the mouth of the river should therefore be completed to the depth of 10 feet, with a width of 100 feet throughout, and East Pass should be deepened to 20½ feet, as contemplated in the approved project.

Estimate for work recommended is as follows:

For dredging channel 10 feet deep across bar at mouth of river .....	\$47,300
Deepening East Pass and closing an opening in Dog Island .....	27,450
	<hr/> 74,750
Of which there has already been appropriated .....	20,000
Total .....	<hr/> 54,750

## Money statement.

July 1, 1902, balance unexpended .....	\$20,000.00
June 30, 1903, amount expended during fiscal year .....	272.86
	<hr/> 19,727.14
July 1, 1903, balance unexpended .....	<hr/> 54,750.00
{ Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903 .....	
{ Submitted in compliance with requirements of sundry civil act of June 4, 1897. ....	

## APPROPRIATIONS.

June 3, 1896 .....	\$10,000.00
March 3, 1899 .....	10,000.00
June 6, 1900 (allotment) .....	1,704.08
June 13, 1902 .....	20,000.00
Total .....	<hr/> 41,704.08

# APPENDIX S—REPORT OF CAPTAIN CAVANAUGH. 1209

## COMMERCIAL STATISTICS.

The following information has been obtained from the collector of customs, port of Carrabelle, Fla.:

Exports to foreign ports.....	\$191,328.77
Exports to coastwise ports.....	202,618.50
Total amount of exports.....	393,947.27

	Number.	Tons.
Vessels entering from—		
Foreign ports.....	51	25,725
Coastwise ports.....	13	6,840
Total.....	64	32,565
Vessels cleared for—		
Foreign ports.....	31	15,041
Coastwise ports.....	27	13,741
Total.....	58	28,782
Number of vessels employed in traffic of port:		
Steam.....	5	907

Amount of fees and dues paid to custom-house during fiscal year ending June 30, 1903, \$1,530.18.

## *Freight carried.*

Articles.	Quantity.	Value.
Lumber:		
Foreign.....feet B. M.....	9,676,935	\$134,988.34
Coastwise.....do.....	9,284,152	138,043.50
Resin:		
Foreign.....barrels.....	27,489	56,340.43
Coastwise.....do.....	18,450	64,575.00
Total value.....		393,947.27

## S 2.

### IMPROVEMENT OF HARBOR AT APALACHICOLA BAY, FLORIDA.

A description of this locality, its original and present conditions, and the project for improvement are given in the Annual Report of the Chief of Engineers for 1903, page 291.

Work done prior to June 30, 1900, is described on pages 2092–2095, Annual Report of the Chief of Engineers for 1900.

### OPERATIONS DURING THE FISCAL YEAR ENDING JUNE 30, 1903.

From the appropriation of \$40,000 made by the river and harbor act of June 13, 1902, an allotment of \$10,000 was made for dredging a 9-foot channel through the bar at the mouth of Apalachicola River, and contract was entered into with the National Dredging Company, of Wilmington, Del., for the execution of the work at 29 cents per cubic yard. Shortly after dredging had been commenced under this contract it developed that no relief to the commerce of the port could be obtained by the expenditure of \$10,000, and an additional allotment of \$10,000 was therefore obtained and expended under supple-

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mental contract, the price per cubic yard being reduced from 29 cents to 22 cents.

Dredging was commenced November 13, 1902, and was continued until February 17, 1903, when a channel 80 feet wide and 9 feet deep at mean low water had been secured from a point 1,047 feet south of the red beacon to deep water in the river. As there remained a small balance from these allotments, a channel 567 feet by 80 feet and 9 feet deep was dredged through the "oyster lump" on the line marked by St. George's light. This work has secured a channel 9 feet deep at low water from the town of Apalachicola to the deep-water anchorage of West Pass.

The total number of cubic yards of material removed was 74,256, at a total cost of \$20,000. In addition to this dredging the contractor drove 16 clusters of three piles each every 400 feet along the east side of the dredged channel.

Proposals for dredging across the sea bar at West Pass entrance to Apalachicola Bay and the Link channel were opened on April 4, 1903. The only bid received was that made by Mr. Rittenhouse Moore, of Mobile, Ala., at 30 cents per cubic yard. This bid was rejected on account of bidder's insufficient plant. \* \* \*

It is proposed to expend the balance available in dredging the bar at West Pass entrance to Apalachicola Bay and Link channel and to apply the additional appropriation recommended to completion of the present project and to maintenance of the channel.

RECOMMENDATIONS AND ESTIMATES.

The importance of a deep-water harbor in this vicinity can not be overestimated, and as a great system of navigable rivers has its outlet at Apalachicola Bay this improvement is entitled to special consideration.

The full amount necessary for the completion of the project should be appropriated or provided for under the continuing-contract system and the channel then maintained, as only in this way can any permanent and satisfactory results be obtained.

The expenditures made upon the channel since the adoption of the approved project have been practically absorbed in maintenance.

Estimate for work recommended is as follows:

For completion of present project .....	\$330,000
For maintenance .....	30,000
Total .....	360,000
Of which there has been appropriated .....	20,000

*Money statement.*

July 1, 1902, balance unexpended .....	\$40,000.00
June 30, 1903, amount expended during fiscal year .....	20,443.55
July 1, 1903, balance unexpended .....	19,556.45
July 1, 1903, outstanding liabilities .....	14.80
July 1, 1903, balance available .....	19,541.65
(Amount (estimated) required for completion of existing project .....	330,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903:	
For works of improvement .....	\$330,000.00
For maintenance of improvement .....	10,000.00
	340,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

APPENDIX S—REPORT OF CAPTAIN CAVANAUGH. 1211

APPROPRIATIONS.

March 2, 1833.....	\$8,700	
July 4, 1836.....	10,000	
March 3, 1839.....	9,900	
		\$28,600
June 14, 1880.....	10,000	
March 3, 1881.....	10,000	
August 2, 1882.....	25,000	
July 5, 1884.....	10,000	
August 5, 1886.....	12,000	
August 11, 1888.....	20,000	
September 19, 1890.....	20,000	
July 13, 1892.....	20,000	
August 18, 1894.....	15,000	
June 3, 1896.....	12,000	
		154,000
March 3, 1899.....	20,000	
June 13, 1903.....	40,000	
		60,000
Total.....		242,600

COMMERCIAL STATISTICS FOR PORT OF APALACHICOLA, FLA., FROM JULY 1, 1902,  
TO JUNE 30, 1903.

Exports to foreign ports.....	\$245,130.00
Exports to coastwise ports.....	509,445.00
Total.....	754,575.00
Imports from foreign ports.....	711.26
Duties on imports and miscellaneous collections.....	269.83
Total.....	981.09

	Number.	Tons.
Vessels entered from—		
Foreign ports.....	56	28,853
Coastwise ports.....	33	17,603
Total.....	89	46,456
Vessels cleared for—		
Foreign ports.....	38	19,549
Coastwise ports.....	49	25,582
Total.....	87	45,131
Steam vessels employed in traffic of port.....	24	1,404
Sail vessels employed in traffic of port.....	19	151
Total.....	43	1,555

Amount of fees and dues to custom-house during fiscal year ending June 30, 1903, \$1,639.78.

*Freight carried.*

Articles.	Quantity.	Value.
Lumber.....	feet B. M. 31,291,000	\$622,884
Rosin.....	barrels 20,255	131,691
Total.....		754,575



## S 3.

IMPROVEMENT OF APALACHICOLA RIVER, THE CUT-OFF, AND  
LOWER CHIPOLA RIVER, FLORIDA.

Description of this river, statement of project for its improvement, and facts concerning its original and present conditions are given in Annual Report of the Chief of Engineers for 1903, page 292.

A complete synopsis of work done upon the river from January 1, 1875, to June 30, 1895, may be found in Annual Report of the Chief of Engineers for 1896, pages 1348-1350. Work from June 30, 1895, to June 30, 1901, is described in Annual Reports of the Chief of Engineers for 1900, pages 2096-2097, and for 1901, pages 1769-1771.

## OPERATIONS DURING THE FISCAL YEAR ENDING JUNE 30, 1903.

The snag boat *Flint* was employed on this stream during a part of the low-water season, and the following work was accomplished:

Overhanging trees removed .....	1,951
Overhanging trees trimmed .....	5
Snags removed from river .....	1,226
Bushes cut (estimated) .....	2,000

It is proposed to apply the available balance to removing snags, logs, and overhanging trees in the Apalachicola River, and in the Cut-off, Lower Chipola River, and Lee Slough, to remove snags, logs, and overhanging trees, and widen the slough by dredging the banks in the narrow places, as far as the funds will permit. Lee Slough is narrow and deep, and in many places the sharp points can be dredged off and the material dumped into the stream without detriment.

## RECOMMENDATIONS AND ESTIMATES.

The Apalachicola River proper requires nothing but the removal of snags, logs, and overhanging trees which annually accumulate.

The Cut-off and Lower Chipola, will require snagging, removal of overhanging timber, and widening in places, especially at sharp turns, by dredging.

It is thought that the slough will eventually become the main river, and as there are no landings on the old river in this section it would be advisable to aid the change in every way possible.

Estimate for the work recommended is as follows:

For snagging and removing overhanging timber in Apalachicola River ..	\$5,000
For widening and straightening the Cut-off, Lower Chipola River and Lee Slough, and removing obstructions from same .....	20,000
Total .....	25,000

*Money statement.*

July 1, 1902, balance unexpended .....	\$6,000.00
June 30, 1903, amount expended during fiscal year .....	1,842.24
July 1, 1903, balance unexpended .....	4,157.76
(Amount (estimated) required for completion of existing project .....	15,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903:	
For works of improvement .....	\$15,000.00
For maintenance of improvement .....	5,000.00
	20,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

# APPENDIX 8—REPORT OF CAPTAIN CAVANAUGH. 1213

## APPROPRIATIONS.

May 23, 1828.....	\$3,000	
April 23, 1830.....	2,000	
March 2, 1831.....	8,000	
		\$18,000
June 23, 1874.....	10,000	
March 3, 1875.....	10,000	
June 18, 1878.....	8,000	
March 3, 1879.....	5,000	
June 14, 1880.....	2,000	
March 3, 1881.....	1,500	
August 2, 1882.....	2,000	
July 5, 1884.....	1,000	
August 5, 1886.....	1,000	
August 11, 1888.....	2,000	
		42,500
September 19, 1890.....	2,000	
July 13, 1892.....	5,000	
August 18, 1894.....	5,000	
June 3, 1896.....	5,000	
March 3, 1899.....	3,000	
June 6, 1900 (allotment from emergency act).....	1,500	
June 13, 1902.....	6,000	
		27,500
Total.....		83,000

## COMMERCIAL STATISTICS.

The commerce interested on this river is chiefly cotton, naval stores, general merchandise, saw logs, and timber for export. This river runs through a section of country where there are no railroads, and the country bordering upon it depends largely on the steamboats for transportation of products and supplies. There is also a large passenger traffic on the river.

Reference is made to reports on the Flint and Upper Chipola rivers for detailed statistics.

## S 4.

### IMPROVEMENT OF UPPER CHIPOLA RIVER, FLORIDA, FROM MARIANNA TO ITS MOUTH.

Description of this river and statements of its past and present conditions and of the project are given in the Annual Report of the Chief of Engineers for 1903, page 294.

The work done is described on pages 2099-2100, Annual Report of the Chief of Engineers for 1900.

### OPERATIONS DURING THE FISCAL YEAR ENDING JUNE 30, 1903.

No work has been done on this improvement during the fiscal year ending June 30, 1903. It is proposed to expend the available balance in removing the logs, snags, and overhanging trees, blasting out cypress stumps and knees from the channel through the "Dead Lakes" and up the Chipola River to "Look and Tremble" shoal, when high water on the Flint River makes the necessary plant available.

## 1214 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

## RECOMMENDATIONS AND ESTIMATES.

It is recommended that further work upon this waterway be confined to the removal of snags, logs, overhanging trees, and cypress trees and stumps between "Look and Tremble" shoal and the foot of the Dead Lakes at the Lower Chipola River, and to dredging a channel through the mud bar at Sister Islands. This work will open up a waterway from the Apalachicola River system to "Look and Tremble" shoal, about 45 miles below Marianna. To extend the improvement farther would require the construction of at least one lock and dam and very expensive channel work over rock shoals, therefore no further work is recommended, as the river has already been cleaned of snags above "Look and Tremble" shoal, and in high stages barges can bring down freight from Marianna to the shoal and then transfer it.

Estimate for the work recommended is as follows:

To complete the channel through the Dead Lakes to Look and Tremble shoal.....	\$7,000
Remove bar at Sister Islands.....	1,500
Total.....	8,500

Of which \$2,000 has been appropriated.

The additional appropriation recommended is needed to complete the channel through the Dead Lakes, remove the mud bar at Sister Islands, to remove overhanging trees and the annual accumulation of snags.

After the completion of the improvement recommended it could very conveniently be maintained in connection with similar operations upon the entire Apalachicola River system, as the plant necessary for this purpose is already available in connection with work upon this system.

*Money statement.*

July 1, 1902, balance unexpended.....	\$2,000.00
July 1, 1903, balance unexpended.....	2,000.00
(Amount (estimated) required for completion of existing project.....	34,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1905, for maintenance of improvement, in addition to the balance unexpended July 1, 1903.....	6,500.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1890.	

## APPROPRIATIONS.

March 3, 1899.....	\$5,000
June 13, 1902.....	2,000
Total.....	7,000

## COMMERCIAL STATISTICS.

*Statement of business done during past fiscal year on the upper Chipola, Florida.*

Name and description.	Registered tonnage.	Draft.		Number of round trips made, and between what places.
		Light.	Loaded.	
Little Belle (tug and barges).	2	Feet. 3½	.....	64 from mouth Dead Lakes to Cotton Bluff; 30 from mouth Dead Lakes to Steel Bridge.

*Freight carried.*

Articles.	Quantity.	Tons.
Cotton-seed meal.....sacks.....	400	20
Fertilizers.....do.....	1,400	140
Oats.....do.....	1,012	100
Corn.....do.....	1,332	140
Hay.....bales.....	1,819	630
Rosin.....barrels.....	18,837	4,787
Turpentine.....do.....	12,033	2,707
Flour.....do.....	500	50
Sugar.....do.....	40	6
Molasses.....do.....	20	3
Ties.....bundles.....	400	5
General miscellaneous.....packages.....	14,080	1,408
Lumber.....feet.....	180,000	320
Provisions, case goods.....packages.....	200	10
Coffee.....sacks.....	83	3
Corn meal.....do.....	780	38
Bacon, smoked and dressed shoulder.....boxes.....	200	35
Salt.....sacks.....	52	5
Lard.....packages.....	68	8
Soap.....boxes.....	50	3
Nails.....kegs.....	59	3
Shingles.....number.....	20,000	200
Brick.....do.....	6,000	120
Total.....		10,716

Estimated value of above freights, \$637,000.

Large quantities of pine and cypress timber are rafted down this stream, the value of which is not known, but it is included in the valuation of the timber for Apalachicola and Carrabelle Harbors, Florida.

## S 5.

## IMPROVEMENT OF FLINT RIVER, GEORGIA.

For previous history, statements of project, and present conditions, see Annual Report of the Chief of Engineers for 1893, page 295.

For a detailed account of past operations, see Annual Reports of the Chief of Engineers for 1900, pages 2102-2103; 1901, pages 1773-1775.

## OPERATIONS DURING THE FISCAL YEAR ENDING JUNE 30, 1903.

Under contract with the M. A. Sweeney Shipyard and Foundry Company, of Jeffersonville, Ind., a drilling barge 24 by 65 by 3 feet 9 inches has been completed and delivered, and a snagboat 26 by 75 by 4 feet 9 inches is under construction and nearly finished.

Very little work has been done upon the river during the year, as the drilling barge was not available until the latter part of May, 1903. The following was accomplished:

Overhanging trees removed.....	14
Overhanging trees trimmed.....	25
Rock excavated.....cubic yards.....	300

## RECOMMENDATIONS AND ESTIMATES.

It is recommended that work hereafter be confined to the sections below Albany, connecting the two navigable sections by completing the improvement of the portion between Newton and Bainbridge, removing isolated bowlders below the latter point and snagging the river whenever necessary by way of maintenance. Notwithstanding

## 1216 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

the fact that a small dipper dredge has been built for use upon the Chattahoochee, Flint, and Apalachicola rivers, it is believed that for an economical prosecution of work a second dredge of about 1 cubic yard capacity should be built at a cost of about \$10,000, for use upon Flint River alone. In no other way than by dredging can the débris from blasting rock bars be economically removed. The dredge now on hand will be needed for several years upon the Chattahoochee exclusively.

It is proposed to apply the funds now on hand to payment for the plant now building under contract, to removal of bowlders between Bainbridge and the mouth of the river, and to removal of rock reefs between Bainbridge and Newton by blasting and dredging.

Estimate for the work recommended is as follows:

For removing bowlders below Bainbridge .....	\$4, 000
For a dredge .....	10, 000
For channel work between Bainbridge and Newton .....	20, 000
For maintenance (snagging, etc) .....	5, 000
<b>Total .....</b>	<b>39, 000</b>

*Money statement.*

July 1, 1902, balance unexpended .....	\$25, 140. 51
June 30, 1903, amount expended during fiscal year .....	4, 111. 89
July 1, 1903, balance unexpended .....	21, 028. 62
July 1, 1903, outstanding liabilities .....	8, 583. 08
July 1, 1903, balance available .....	12, 445. 54
July 1, 1903, amount covered by uncompleted contracts .....	7, 460. 00
(Amount (estimated) required for completion of existing project .....	92, 000. 00
Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903:	
For works of improvement .....	\$22, 000. 00
For maintenance of improvement .....	5, 000. 00
	27, 000. 00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

## APPROPRIATIONS.

June 23, 1874 .....	\$18, 000	August 11, 1888 .....	\$20, 000
March 3, 1875 .....		September 19, 1890 .....	20, 000
August 14, 1876 .....		July 13, 1892 .....	15, 000
June 18, 1878 .....	10, 000	August 18, 1894 .....	8, 000
March 3, 1879 .....	7, 000	June 3, 1896 .....	8, 000
June 14, 1880 .....	20, 000	March 3, 1899 .....	5, 000
March 3, 1881 .....	15, 000	June 13, 1902 .....	25, 000
August 2, 1882 .....	25, 000		
July 5, 1884 .....	20, 000	<b>Total .....</b>	<b>236, 000</b>
August 5, 1886 .....	20, 000		

## CONTRACTS IN FORCE.

Contract with the M. A. Sweeney Shipyard and Foundry Company, of Jeffersonville, Ind., approved February 10, 1903, for constructing, equipping, and delivering, complete, ready for service, one snag boat, \$7,460, and one drilling barge, \$2,960. The barge has been completed and paid for, and the snag boat is practically completed.

# APPENDIX 8—REPORT OF CAPTAIN CAVANAUGH. 1217

## COMMERCIAL STATISTICS.

The commerce of this stream is principally cotton, naval stores, and lumber. There are great quantities of fine timber along the banks of the river, mainly pine, cypress, and hardwood.

When the river is made navigable from Albany to Bainbridge the entire year it will greatly benefit these industries and new ones will spring up along the river. For the Flint River alone, the following statistics have been received:

Stern-wheel steamboats.	Registered tonnage.	Draft.		Between—	Passengers.
		Light.	Loaded.		
		<i>Inches.</i>	<i>Feet.</i>		
J. P. Williams .....	61	20	4	3 trips weekly between Albany and Bainbridge, Ga.	500
Beessie Clary .....	43	16	4	3 trips weekly between Albany and Chattahoochee, Fla.	
John R. Sharpe.....	50	18	4		

## Freight carried.

Articles.	Quantity.	Tons.
Cotton .....	bales 5,000	1,250
Cotton seed .....	sacks 30,000	1,667
Cotton-seed meal .....	do 15,000	750
Fertilizers .....	do 50,000	5,000
Oats .....	do 1,500	150
Corn .....	do 4,500	345
Hay .....	bales 8,000	300
Roan .....	barrels 50,000	12,500
Turpentine .....	do 20,000	4,500
Flour .....	do 500	25
Sugar .....	do 100	14
Molasses .....	do 1,000	250
Bagging .....	rolls 2,000	50
Ties .....	bundles 1,500	18
General miscellaneous .....	packages 10,000	1,000
Live stock .....	head 50	10
Lumber .....	feet 200,000	400
Staves .....	pieces 500,000	5,000
Provisions—case goods .....	packages 2,000	200
Coffee .....	sacks 200	17
Corn meal .....	do 2,000	100
Bacon, smoked and dressed shoulders .....	boxes 400	66
Salt .....	sacks 2,000	200
Lard .....	packages 500	62
Soap .....	boxes 1,000	50
Nails .....	kegs 1,000	50
Shingles .....	number 150,000	75
Brick .....	do 200,000	500
Total .....		34,549

Estimated value of above freights (in round numbers), \$1,727,000.

The quantities above refer to that section of the river between Albany, Ga., and Bainbridge, Ga.

Between Bainbridge and the mouth of the river the stream is used by the steamers plying the Chattahoochee and Apalachicola rivers, and for the commerce of this entire system reference is made to the following table:

Stern-wheel steamboats.	Registered tonnage.	Draft.		Round trips.	Passengers.
		Light.	Loaded.		
		<i>Inches.</i>	<i>Inches.</i>		
M. W. Kelly .....	95	18	48	a 45	4,100
Queen City .....	150	24	48	b 161	14,586
W. C. Bradley .....	175	20	48	c 45	4,375
J. W. Hires .....	125	20	48	d 22	1,604
Three States .....	125	18	48	e 20	
Eunola .....	80	20	28	f 2	384
Carrie May (propeller) .....	4	36	60	d 318	

a Between Columbus, Ga., and Apalachicola, Fla.

b Between Bainbridge, Ga., and Chattahoochee and Apalachicola, Fla.

c Weekly between Alaga, Ala., and Cochran's Landing, Fla., on Lower Chipola River.

d Between Iola and Wewahitchka, Fla.

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*Freight carried.*

Articles.	Quantity.	Tons.
Cotton .....	bales.. 13,450	3,362
Cotton seed .....	sacks.. 48,900	2,717
Cotton-seed meal .....	do.. 10,500	575
Fertilizers .....	do.. 55,580	5,580
Grain .....	do.. 40,985	4,098
Hay .....	bales.. 300	15
Rosin .....	barrels.. 95,415	23,854
Turpentine .....	do.. 27,158	6,109
Flour .....	do.. 212	21
Sugar .....	do.. 25	3
Molasses .....	do.. 4,302	1,075
Bagging .....	rolls.. 100	3
Ties .....	bundles.. 125	2
General miscellaneous .....	packages.. 308,705	67,100
Hides and skins .....	do.. 90	18
Live stock .....	head.. 257	43
Lumber .....	feet.. 857,000	1,714
Provisions, case goods .....	packages.. 224,060	22,400
Corn meal .....	sacks.. 300	10
Bacon, smoked and dressed shoulder .....	boxes.. 25	4
Ice .....	sacks.. 11,500	1,150
Shingles .....	number.. 2,910,000	363
Brick .....	do.. 390,000	790
Total .....		140,976

Estimated value of above freights, \$12,687,000.

In addition to the above, large quantities of timber are carried down these streams to sawmills near Apalachicola Bay, of which no value is given, as there seems to be some difficulty in keeping a record of the amount of timber rafted down, but its value is included in the general value of the commerce reported for Apalachicola Bay, Florida.

## S 6.

## IMPROVEMENT OF CHATTAHOOCHEE RIVER, GEORGIA AND ALABAMA.

## GENERAL IMPROVEMENT.

For descriptions and statements of project see Annual Report of the Chief of Engineers for 1903, page 296. For detailed statements of past operations see Annual Reports of the Chief of Engineers as follows: 1898, pages 1388-1390; 1900, pages 2107-2108; 1901, pages 1775-1777; 1902, pages 1263-1264.

## OPERATIONS DURING THE FISCAL YEAR ENDING JUNE 30, 1903.

The snag boats *Chattahoochee* and *Flint* worked over the entire river from Columbus, Ga., to Chattahoochee, Fla. The following was accomplished during the working season:

Overhanging trees removed .....	2,690
Overhanging trees trimmed .....	364
Logs removed .....	295
Bushes cut .....	485
Snags removed .....	1,693
Stumps on banks cut level .....	9
Bushes cut for jetty work at Jenny Island .....	cords.. 12
Jetty built at Jenny Island .....	linear feet.. 1,346
Sand bags built at Jenny Island .....	3,133
Mattresses laid for shore protection at Jenny Island .....	square feet.. 3,700

Both the snag boats *Chattahoochee* and *Flint* were taken to Apalachicola, Fla., hauled out on the ways, and thoroughly repaired.

Under contract with the M. A. Sweeney Ship Yard and Foundry Company, of Jeffersonville, Ind., two rock barges have been completed and delivered, and two dump scows, one barge with sand pump, and one towboat are under construction.

It is proposed to apply the available balance on this river to completion of plant under construction; to building a system of jetties for a distance of about 2 miles below Columbus, Ga., commencing at the wharf; to removing the annual accumulation of logs and snags, and to such other emergency work below this point as may be found necessary, and which funds will provide for.

#### RECOMMENDATIONS AND ESTIMATES.

In addition to work for which funds have already been provided the following is of immediate importance and is recommended: The old works on the improvement should be repaired, as in many places the rock and gravel filling has completely washed out of the pile jetties; works of contraction and shore protection should be built at the following places where the river has excessive width, viz, Jennys Island, Mound bar, Abercrombies bar, Woolfolks, Shell Creek, Gunboat shoals, St. Francis Bend, and Smiths Bend, and rock and marl reefs should be removed at Slick Bluff, Rock Island, Kings rock, and other points of lesser importance.

At all times the river should be maintained clear of snags and other similar obstructions.

Estimate for the work recommended is as follows:

Operating snag boats <i>Flint</i> and <i>Chattahoochee</i> (two years) .....	\$30,000
Operating dipper dredge (two years) .....	10,000
Operating suction dredge (two years) .....	10,000
Operating towboat (two years) .....	10,000
Repairs to works of contraction .....	10,000
Building additional works of contraction .....	60,000
Removing rock and marl reefs (drilling and blasting) .....	10,000
Repairs and care of plant .....	10,000
Total .....	150,000

#### Money statement.

July 1, 1902, balance unexpended .....	\$102,743.95
June 30, 1903, amount expended during fiscal year .....	28,793.13
July 1, 1903, balance unexpended .....	73,950.82
July 1, 1903, outstanding liabilities .....	43,238.91
July 1, 1903, balance available .....	30,711.91
July 1, 1903, amount covered by uncompleted contracts .....	41,200.00
<hr/>	
{ Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903:	
For works of improvement .....	\$60,000.00
For maintenance of improvement .....	60,000.00
	120,000.00
{ Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	



## 1220 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

### APPROPRIATIONS.

February 24, 1835.....	\$2,000.00	July 13, 1892.....	\$20,000.00
June 23, 1874.....		August 18, 1894.....	<sup>b</sup> 25,000.00
March 3, 1875.....	<sup>a</sup> 52,000.00	June 3, 1896.....	<sup>b</sup> 20,000.00
August 14, 1876.....		March 8, 1899.....	<sup>b</sup> 45,000.00
June 18, 1878.....	18,000.00	June 13, 1902.....	100,000.00
March 3, 1879.....	15,000.00	Amount of unexpended bal-	
June 4, 1880.....	20,000.00	ance transferred from ap-	
March 3, 1881.....	20,000.00	propriation for Chatta-	
August 2, 1882.....	25,000.00	hoochee River between	
July 5, 1884.....	35,000.00	West Point and Franklin.....	280.78
August 5, 1886.....	20,000.00		
August 11, 1888.....	20,000.00	Total.....	<sup>c</sup> 457,280.78
September 19, 1890.....	20,000.00		

### CONTRACTS IN FORCE.

Contracts with the M. A. Sweeney Ship Yard and Foundry Company, of Jeffersonville, Ind., approved February 10, 1903, for constructing, equipping, and delivering complete one stern-wheel towboat, \$20,700; two rock barges for \$8,000; one suction dredge, \$12,900, and two dump scows for \$7,600. Work was commenced in February, 1903.

Two rock barges have been completed and delivered. Two dump scows are nearly completed, the suction dredge has been commenced, and the towboat is not yet started.

### COMMERCIAL STATISTICS.

The commerce interested on this river is chiefly cotton, naval stores, and general merchandise. The river runs through a section of country where there are but few railroads (none parallel with the river), and the people depend largely on the boats for their supplies. There is also a large passenger traffic on the river.

The commercial statistics for the Chattahoochee River are so combined with those of the Flint and Appalachicola and Upper Chipola rivers that a separation is impossible, and reference is made to report upon Flint and Upper Chipola river improvements for detailed statistics.

Columbus, Ga., at the head of navigation, with its magnificent water power, is rapidly becoming one of the greatest manufacturing centers of the South, and, with the completion of the deep-water harbor projected at the mouth of this system of rivers, the importance of this improvement will be greatly increased.

## S 7.

### IMPROVEMENT OF CHOCTAWHATCHEE RIVER, FLORIDA AND ALABAMA.

For description, statements of project, and original and present conditions, see Annual Report of the Chief of Engineers for 1903, page 298.

#### OPERATIONS DURING THE FISCAL YEAR ENDING JUNE 30, 1903.

Snagging operations were suspended in December, 1900, at which time the river was in a fair navigable condition from Caryville to

<sup>a</sup> Allotted from appropriations aggregating \$70,000 for improving Chattahoochee and Flint rivers.

<sup>b</sup> Does not include \$5,000 allotted for expenditure between West Point and Franklin.

<sup>c</sup> Of this amount \$2,000 (appropriation of February 24, 1835) was carried to the surplus fund.

Geneva at low water, and between Geneva and Pate Landing, Alabama, on stages about 2 feet above low water. Very little snagging work has been performed since, and the channel is again considerably obstructed by snags and logs.

The old snag boat, lost in December, 1900, was replaced by a new one, the hull of which was built at Pine Barren, Fla., and completed in August, 1902. In December, 1902, such of the old machinery as was suitable for the new boat was shipped from Geneva, Ala., to Pine Barren, Fla., the necessary new parts purchased, and the work of installing it begun.

The installation was completed in all details, and the new boat left Pine Barren, Fla., June 16, 1903, for Geneva, Ala., where she arrived on June 23, 1903, and commenced work on June 24, 1903.

The work of dredging a channel through the bar at the mouth of the river, known as Cypress Top, provided for by the last river and harbor bill, was commenced in March, 1903, with the snag boat *Escambia*, and an 8-inch centrifugal pump installed upon a barge. The dredged cut is 60 feet wide and  $5\frac{1}{2}$  feet deep at low water, and to protect it and provide for the disposition of dredged material, parallel bulkheads are built on each side of the channel about 82 feet apart and the sand discharged behind them. The bulkheads are constructed of deals 9 by 3 inches, driven 6 feet apart, and planked up on the outside from the bottom to above low water. The dredged material strengthens these bulkheads and protects them against wave action, and it is hoped that with the bulkheads practically permanent banks for the protection of the channel will be secured. Satisfactory progress has been made, aside from occasional breakdowns in machinery, which is old and worn. The dredged channel will be 1,160 feet long by 60 feet wide, and it is expected the depth secured will be at least  $5\frac{1}{2}$  feet at low water. The original depth was but  $2\frac{1}{2}$  feet. The following was accomplished during the working season:

Piles driven .....	436
Bulkhead completed .....	feet 2,383
Cubic yards dredged .....	6,636

With the funds available it is proposed to complete the dredging at the Cypress Top mouth, to remove the obstructions from the channel below the mouth of the Holmes River as far as possible, and to continue work of removing obstructions from Geneva to Newton.

#### RECOMMENDATIONS AND ESTIMATES.

As Geneva, Newton, and a point between them are now touched by railroads, which have taken away from this part of the river the little commerce that formerly made use of it, it is recommended that no further funds be appropriated for this part of the river, as its further improvement and maintenance would be very expensive, due to the character of the channel and the caving of the banks, which throw a large number of trees into it every year.

Below Geneva the river should be kept free of snags to enable rafts of logs and timber to be floated down, and the bar at the mouth of the river (Cypress Top) should be kept dredged to a least depth of 5 feet to enable tugs to enter the river to secure and make up their tows of timber and logs.

Three boats are now employed between Vernon, on the Holmes River, and Pensacola, Fla., and in order to provide for this trade, which has

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practically sprung up during the present fiscal year, some snagging should be done in the Choctawhatchee below the Holmes, and additional dredging on the bar at the Cypress Top mouth should be provided for.

Estimate for the work recommended is as follows:

For snagging operations below Geneva .....	\$10,000
For dredging at Cypress Top .....	5,000
<b>Total .....</b>	<b>15,000</b>

### *Money statement.*

July 1, 1902, balance unexpended .....	\$16,223.23
June 30, 1903, amount expended during fiscal year .....	7,296.79
<b>July 1, 1903, balance unexpended .....</b>	<b>8,926.44</b>
July 1, 1903, outstanding liabilities .....	1,768.90
<b>July 1, 1903, balance available .....</b>	<b>7,157.54</b>
<div style="display: flex; align-items: center;"> <div style="font-size: 3em; margin-right: 10px;">{</div> <div>           Amount that can be profitably expended in fiscal year ending June 30, 1905, for maintenance of improvement in addition to the balance unexpended July 1, 1903.         </div> <div style="margin-left: 10px;">15,000.00</div> </div>	
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

### APPROPRIATIONS.

March 3, 1833 .....	\$5,000.00	September 19, 1890 .....	\$12,500.00
June 15, 1844 .....	10,000.00	July 13, 1892 .....	12,500.00
June 25, 1874 .....	5,000.00	August 18, 1894 .....	6,000.00
March 3, 1875 .....	5,000.00	June 3, 1896 .....	5,000.00
August 4, 1876 .....	5,000.00	March 3, 1899 .....	16,000.00
March 3, 1879 .....	5,000.00	June 13, 1902 .....	16,000.00
June 14, 1880 .....	7,000.00		
March 3, 1881 .....	10,000.00	<b>Total .....</b>	<b>178,000.00</b>
August 2, 1882 .....	<sup>a</sup> 18,000.00	Carried to the surplus fund,	
July 5, 1884 .....	15,000.00	1852 .....	2,123.88
August 5, 1886 .....	15,000.00		
August 11, 1888 .....	10,000.00	<b>Balance .....</b>	<b>175,876.62</b>

### COMMERCIAL STATISTICS.

The commerce of this stream is mainly saw logs, timber, naval stores, and general merchandise, the value of which for the fiscal year ending June 30, 1903, is estimated to be about \$1,500,000.

### S 8.

#### IMPROVEMENT OF LAGRANGE BAYOU, FLORIDA, INCLUDING HOLMES RIVER, FLORIDA, FROM VERNON TO ITS MOUTH.

For descriptive statement of conditions and project, see Annual Report of the Chief of Engineers for 1903, page 298.

No work was done during the past fiscal year.

<sup>a</sup> Does not include \$2,000 allotted for expenditure on Holmes River.

## RECOMMENDATIONS AND ESTIMATES.

With the unexpended balance, which is available for maintenance of the improvement, it is proposed to resume this work as soon as the snagboat *Choctawhatchee* can be spared from work on the Choctawhatchee River. No additional appropriation will be needed at present.

*Money statement.*

July 1, 1902, balance unexpended .....	\$2,070.20
July 1, 1903, balance unexpended .....	2,070.20

## APPROPRIATIONS.

August 2, 1882 .....	<sup>a</sup> \$2,000
August 5, 1886 .....	2,000
August 11, 1888 .....	8,000
September 19, 1890 .....	8,000
Total .....	<sup>b</sup> 10,000

## S 9.

## IMPROVEMENT OF PENSACOLA HARBOR, FLORIDA.

For description of original condition of the improvement, project and work done, see Annual Report of the Chief of Engineers for 1903, page 299.

## OPERATIONS DURING THE FISCAL YEAR ENDING JUNE 30, 1903.

At the request of the commandant of the navy-yard, the boat house for the launch *Arrow* was removed from the yard, and was rebuilt on suitable pile foundations at Fort Barrancas, near the wharf.

The total cost of this work was \$350, half of which was paid from the appropriation for improvement of Pensacola Harbor, Florida.

No dredging has been done during the year, work upon the channel being confined to examinations made to determine progress of the shoaling.

At the beginning of the fiscal year the dredge *Comstock* had just completed work, and the Caucus channel had a low-water depth of 30 feet, for a width of 100 feet, and a similar depth of 28 feet for an additional width of 100 feet.

The examinations made during the year indicate that the gradual shoaling which has heretofore been reported has continued, but has not been so marked during the past year, and has one exceptional feature. In the past the point of greatest shoaling has been near the intersection of Caucus range with the McRee or Inner bar range, but during the past year no shoaling has occurred at this point, and none has been found in the Caucus channel proper until a point 1,250 feet south of this intersection is reached. From this latter point for

<sup>a</sup> Allotted from appropriation of \$20,000 for improving Choctawhatchee River.

<sup>b</sup> Of this amount there was returned to the Treasury \$4,839.20, which was reapropriated by act of March 3, 1899.

a distance of 2,335 feet the shoaling has been about 1.8 feet, reducing the channel depth over this portion from 30.8 to 29 feet; for the next 1,250 feet the shoaling has been comparatively slight, being not more than 0.8 of a foot. For the next 500 feet it is again about 1.8 feet, and from this point to deep water the average is about 1 foot. This shoaling of the channel from the McRee range south is undoubtedly due to fill from the storm quarter, and is accompanied by a narrowing of the channel. No survey has been made to determine the exact width of the channel; but examinations indicate that the present channel depth at mean low water, viz. 29 feet, is approximately 100 feet in width, and the depth of 28 feet about 50 feet wider. From the intersection of the Caucus range with the old Inner bar range north to the intersection of the Barrancas range with the Caucus range the shoaling has been slight. From this latter intersection to deep water on the harbor side, the shoaling on the east side of the channel has been quite marked, due to the encroachment of the Middle Ground shoal. This shoal can be avoided for the present by swinging to the westward, and in running this portion of the channel the Barrancas beacon is opened to the west an apparent distance of 5 feet, and a 30-foot channel is found. If the Barrancas range lights were kept closed a shoal spot having 28 feet at mean low water would be passed over. The encroachment of the Middle Ground in this locality has been observed for years, and it will at all times be the greatest menace to the channel, and may require a slight shifting of the channel to the westward to avoid it.

The shoaling noted from time to time, and especially that observed during the past fiscal year, indicates that when the project is completed and the side slopes adjusted rapid shoaling need not be feared, and that the previous estimated cost of maintenance is probably well within the amount required.

It is estimated that the completion of the present project for a channel 500 by 30 feet deep will require three years and, including the fill during this period, will require the removal of about 2,000,000 cubic yards, which, if done by the dredge now building, will not cost to exceed \$160,000. But, as the channel must be kept open at any cost, it may be necessary to expend the funds now available during the coming fiscal year for dredging by contract to maintain the channel until the Government dredge is completed. Additional funds should therefore be provided to meet this contingency and to keep the dredge at work for three years after it becomes available. As the cost of dredging by contract is at least twice that by Government dredge, the additional funds required over the estimated cost of completion of project by Government dredge, as above, is \$35,000, which amount, if appropriated, will be available for maintenance should the channel not require dredging during the coming year.

Estimate for work recommended is as follows:

For completion of project with Government dredge now building .....	\$160,000
Probable increase in cost due to dredging by contract prior to completion of dredge .....	35,000
Total .....	195,000

Of which amount \$70,000 has already been appropriated.

# APPENDIX 8—REPORT OF CAPTAIN CAVANAUGH. 1225

## *Money statement.*

July 1, 1902, balance unexpended .....	\$223,661.79
Less amount appropriated for construction of dredge .....	150,000.00
	<u>73,661.79</u>
Amount allotted from emergency river and harbor act of June 6, 1900.....	958.94
	<u>74,618.73</u>
June 30, 1903, amount expended during fiscal year .....	5,468.64
July 1, 1903, balance unexpended .....	69,150.09
July 1, 1903, outstanding liabilities .....	1.75
	<u>69,148.34</u>
Amount (estimated) required for completion of existing project.....	310,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903 .....	125,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897.	

## APPROPRIATIONS.

June 18, 1878 .....	\$20,000	July 13, 1892 .....	\$75,000
March 3, 1879 .....	10,000	August 18, 1894 .....	100,000
June 14, 1880 .....	40,000	June 3, 1896 .....	200,000
March 3, 1881 .....	20,000	March 3, 1899 .....	70,000
August 2, 1882 .....	50,000	June 6, 1900 (allotment) .....	5,000
July 5, 1884 .....	55,000	June 13, 1902 .....	<sup>a</sup> 220,000
August 5, 1886 .....	20,000		
August 11, 1888 .....	35,000	Total .....	945,000
September 19, 1890 .....	25,000		

## COMMERCIAL STATISTICS.

The following information has been obtained from the collector of customs, port of Pensacola, Fla.:

Exports to foreign ports .....	\$13,741,540.00
Exports to coastwise ports .....	( <sup>b</sup> )
Imports from foreign ports .....	1,033,891.00
Duties on imports and miscellaneous collections .....	186,252.63

	Number.	Tons.
<b>Vessels entering from—</b>		
Foreign ports .....	339	434,540
Coastwise ports .....	188	810,169
Total .....	<u>527</u>	<u>1,244,709</u>
<b>Vessels cleared for—</b>		
Foreign ports .....	435	650,733
Domestic ports .....	94	71,072
Total .....	<u>529</u>	<u>721,805</u>
<b>Number of vessels employed in traffic of port:</b>		
Steam .....	36	
Sail .....	141	
Total .....	<u>177</u>	

<sup>a</sup> Includes \$150,000 appropriated for construction of seagoing dredge.

<sup>b</sup> No record.

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Amount of fees, dues, and duties paid to custom-house during the fiscal year ending June 30, 1903, \$208,921.96.

## Freight carried.

	Quantity.	Value.
Cotton .....	bales 148,884	\$6,508,852.00
Lumber .....	feet B. M. 185,912,000	1,973,860.00
Coal .....	tons 218,182	514,410.00
Rosin .....	barrels 169,697	822,084.00
Spirits .....	gallons 236,663	136,684.00
Miscellaneous .....		4,283,500.00
Total .....		13,741,540.00

## S 10.

### IMPROVEMENT OF ESCAMBIA AND CONECH RIVERS, FLORIDA.

For description of this waterway and statements of condition and project, see Annual Report of the Chief of Engineers for 1903, page 301.

The object of the improvement is to keep open a channel suitable for the safe passage of rafts and logs during low stages of the river, and to enable tugs to cross the bar at the river's mouth to handle the raft timber. This object has been partially accomplished.

#### OPERATIONS DURING THE FISCAL YEAR ENDING JUNE 30, 1903.

The snag boat *Escambia*, which had been tied up at Pine Barren, Fla., due to lack of funds, was overhauled during the latter part of August, 1902, and on September 1, 1902, the work of removing obstructions from the river was commenced and continued until high water, December 15, 1902, when the *Escambia* was again taken to Pine Barren, Fla., and placed in charge of a watchman. The plant on this river having been designated for dredging at mouth of Cypress Top, Choctawhatchee River, the *Escambia* and the suction dredge were taken to Brent's ways, Pensacola, Fla., for repairs, leaving Pine Barren, Fla., on January 10, 1903. There the *Escambia* was hauled out and thoroughly repaired, the dredge overhauled, and the plant started for the Choctawhatchee River.

The following work was done during the season:

Snags removed from river .....	575
Logs removed from river .....	414
Stumps cut level .....	259
Overhanging trees cut and removed .....	11
Bushes cut .....	40
Rafts removed from snags .....	14
Wood cut .....	cords 43
Miles of river worked .....	44

It is proposed to apply the funds available to removing obstructions from that part of the river from Brewton to the mouth of the river, and to apply the additional appropriation recommended to maintenance and dredging the bar at the mouth of the river.

#### RECOMMENDATIONS AND ESTIMATES.

The navigable condition of the stream, for rafting purposes, is of vital importance to the lumber trade of the port of Pensacola, and

the channel should be kept free from such obstructions as will delay rafting at low water. Owing to the great length of the river it will require the constant operation of a snag-boat during each low-water season to accomplish this.

It is also of the greatest importance and urgently recommended that the bar at the mouth of the river be dredged to a depth of  $8\frac{1}{2}$  feet for a width of 100 feet to enable boats to pass out with tows of logs and timber.

Estimate for the work recommended is as follows:

For maintenance as outlined above .....	\$10,000
For dredging at the mouth of the river .....	12,000
<b>Total</b> .....	<b>22,000</b>

*Money statement.*

July 1, 1902, balance unexpended .....	\$5,000.00
June 30, 1903, amount expended during fiscal year .....	3,785.69
July 1, 1903, balance unexpended .....	1,214.31
July 1, 1903, outstanding liabilities .....	4.50
July 1, 1903, balance available .....	1,209.81
{ Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903:	
For works of improvement .....	\$12,000.00
For maintenance of improvement .....	9,000.00
	21,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

APPROPRIATIONS.

<b>For Escambia River:</b>	
March 2, 1833 .....	\$5,000
July 2, 1836 .....	5,500
June 14, 1880 .....	8,000
March 3, 1881 .....	5,000
July 5, 1884 .....	8,000
<b>For Escambia and Conecuh rivers:</b>	
August 2, 1882 .....	12,000
July 5, 1884 .....	12,000
August 5, 1886 .....	12,000
August 11, 1888 .....	10,000
September 19, 1890 .....	7,500
July 13, 1892 .....	8,000
August 18, 1894 .....	6,000
June 3, 1896 .....	4,000
March 3, 1899 .....	5,000
June 6, 1890 (allotted from emergency act) .....	1,500
June 13, 1902 .....	5,000
<b>Total</b> .....	<b>109,500</b>
Carried to the surplus fund, 1838 .....	5,500
<b>Balance</b> .....	<b>104,000</b>

COMMERCIAL STATISTICS.

The commerce of this stream is mainly timber, lumber, and saw logs. It is reported as being valued at about 60 per cent of the timber export trade of Pensacola, or, in round numbers, \$1,850,000.



## S II.

## IMPROVEMENT OF ALABAMA RIVER. ALABAMA.

For description, statements of past and present conditions, and project, see Annual Report of the Chief of Engineers for 1903, page 302. Previous operations upon this river will be found in annual reports of the Chief of Engineers, as follows: 1896, pages 1397 et seq.; 1898, pages 1406 et seq.; 1899, pages 1677 et seq.; 1900, pages 2133 et seq.; 1901, pages 1786 et seq., and 1902, pages 1272-1273.

## OPERATIONS DURING FISCAL YEAR ENDING JUNE 30, 1903.

The snag boat *Twining* continued at work whenever possible during the season, but, due to high water, was laid up during the early part of December, 1902.

The following is a summary of the work done:

Overhanging trees removed .....	438
Overhanging trees trimmed .....	478
Bushes on banks cut up .....	15
Logs on banks cut up .....	4
Stumps removed from the river .....	42
Snags removed from the river .....	318
Logs and trees removed from the river .....	3
Deadheads removed from the river .....	34
Drift removed from the river .....	acre. 1

Due to lack of funds no contraction works were built during the year and no repairs were made to those previously constructed.

As the barges used for storage purposes at Montgomery had become unserviceable and liable to sink, all the property stored on them was taken on the snag boat to Wetumpka and stored in the lock yard. While laid up at Montgomery the snag boat *Twining* was generally repaired; she was provided with a new wheel, new steel tank, new canvas roof, and new cavils, the hull and woodwork from main to boiler deck were repainted, and all machinery overhauled and repainted.

In January, 1903, the towboat *John Mills* was loaned temporarily to Capt. William E. Craighill, Corps of Engineers, for work on the Warrior River, no funds being available to keep her employed on this river.

In the latter part of the month of June, 1903, an inspection of the river from Montgomery to its mouth was made to determine where work was most needed, and as a result the snag boat *Twining* commenced clearing out the Dixie Cut-off at the head of Tait shoals on the last day of June, 1903.

## RECOMMENDATIONS AND ESTIMATES.

It is recommended that snagging and dredging operations be continued, that the old works of contraction be repaired where necessary, and that new works be built at Silver Creek shoals, Gardners Island, and Lower Gause bar, all of which work is urgently needed.

It is proposed to expend funds now available and additional funds appropriated in carrying on the work in the order named.

# APPENDIX 8—REPORT OF CAPTAIN CAVANAUGH. 1229

Estimate for the work recommended is as follows:

Repairing old works .....	\$10,000
Building new works of contraction .....	50,000
Removing annual accumulation of snags from the channel (two years) ..	20,000
Dredging at some of the most important points .....	20,000
Preservation and repair of plant .....	5,000
Building two dump scows for dredging .....	8,000
Total .....	113,000

## *Money statement.*

July 1, 1902, balance unexpended .....	\$22,286.97
June 30, 1903, amount expended during fiscal year .....	7,558.12
July 1, 1903, balance unexpended .....	14,728.85
July 1, 1903, outstanding liabilities .....	1,148.66
July 1, 1903, balance available .....	13,580.19
Amount (estimated) required for completion of existing project. ....	176,251.00
Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903:	
For works of improvement .....	\$78,000.00
For maintenance of improvement .....	22,000.00
	100,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

## APPROPRIATIONS.

June 18, 1878 .....	\$25,000
March 3, 1879 .....	30,000
June 14, 1880 .....	25,000
March 3, 1881 .....	20,000
August 2, 1882 .....	20,000
July 5, 1884 .....	10,000
August 5, 1886 .....	15,000
August 11, 1888 .....	20,000
September 19, 1890 .....	20,000
	\$185,000
July 13, 1892 .....	70,000
August 18, 1894 .....	50,000
June 3, 1896 .....	40,000
March 3, 1899 .....	50,000
June 13, 1902 .....	20,000
	230,000
Total .....	415,000

## COMMERCIAL STATISTICS.

*Statement of business done by steamboats plying the Alabama River, Alabama.*

[Compiled from statements made by owners of same and parties interested.]

Name and description.	Registered tonnage.	Draft of water.		Round trips between—
		Light.	Loaded.	
		<i>Inches.</i>	<i>Feet.</i>	
City of Mobile .....	209	22	5	Mobile and Montgomery.
Nettie Quill .....	299	30	6	Mobile and Selma.
Mary .....	250	30	6	Do.
Barge Tide .....	320	10	3	
Barge Wave .....	320	10	3	
Barge Nellie .....	320	10	3	

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## Freight carried.

Articles.	Quantity.	Tons.
Cotton.....bales	53,701	13,425
Cotton seed.....sacks	225,977	12,554
Cotton seed meal.....do	68,246	8,412
Fertilizers.....do	117,000	11,700
Oats.....do	86,400	8,640
Corn.....do	130,146	10,708
Hay.....bales	48,100	2,405
Wool.....do	3,156	631
Rosin.....barrels	41,738	8,344
Turpentine.....do	25,384	5,700
Flour.....do	87,356	8,736
Sugar.....do	14,846	2,078
Molasses.....do	7,967	1,967
Bagging.....rolls	67,188	1,678
Ties.....bundles	78,748	965
General miscellaneous.....packages	90,344	9,084
Hides and skins.....do	1,215	243
Live stock.....head	4,566	766
Lumber.....feet	1,083,126	2,066
Staves.....pieces	331,227	3,213
Provisions (case goods).....packages	104,422	5,221
Coffee.....sacks	9,077	755
Corn meal.....barrels and sacks	94,373	4,718
Bacon, smoked and dry salted.....boxes	28,581	4,754
Salt.....sacks	24,239	2,423
Lard.....packages	29,948	3,743
Soap.....boxes	33,818	1,660
Nails.....kegs	80,983	4,049
Shingles.....M	755,600	7,556
Brick.....do	1,111,520	2,231
Total.....		145,448

Estimated value of above freights (in round numbers)..... \$10,180,000  
Estimated value of hewn, sawn, and round timber..... 3,500,000

Very large quantities of sawn and hewn timber, saw logs, cord wood, etc., consisting of yellow pine, sycamore, cottonwood, poplar, and ash, are barged and rafted down this stream to Mobile, Ala., but the amount of this business can not be accurately stated, as the statistics of the port of Mobile combine the receipts from this stream with those from the Tombigbee and other streams tributary to that port.

## S 12.

### IMPROVEMENT OF COOSA, OOSTANAULA, AND COOSAWATTEE RIVERS, GEORGIA AND ALABAMA.

For description of these rivers and statements of past and present conditions and project, see Annual Report of the Chief of Engineers for 1903, page 303.

#### (a) COOSA RIVER, BETWEEN ROME AND THE EAST TENNESSEE, VIRGINIA AND GEORGIA RAILROAD BRIDGE.

#### OPERATIONS DURING FISCAL YEAR ENDING JUNE 30, 1903.

The extensive repairs to Dam No. 4 were completed early in the fiscal year, the method adopted being fully described in the Report of the Chief of Engineers for 1902, pages 1278-1279.

Under the provisions of the river and harbor act of June 13, 1902

expenditures were limited to that part of the improvement between Rome, Ga., and Lock No. 4, and to the care of Government property belonging to the improvement.

When this appropriation became available the towboat *Leota*, belonging to the improvement, was in such an unserviceable condition that it had to be rebuilt. At the end of the fiscal year the hull had been finished and launched and the upper works were well advanced, and it is expected that the boat will be ready early in the next fiscal year. The work of improvement can be commenced as soon as she is ready for service. The *Leota* is absolutely necessary in carrying on the work in progress and in contemplation, and she should be kept in good condition, ready for work at all times, as no other means of transportation are to be had for any work in progress on the river proper or for maintaining the locks now in operation.

No new work of construction was undertaken during the fiscal year, expenditures being confined to maintenance of existing structures and care of the large amount of plant on hand.

#### RECOMMENDATIONS AND ESTIMATES.

It is recommended that Lock 4 be completed, increasing the lift of the lock and the height of the dam 3 feet in addition to the increase already made, as this will give 6 feet of water for a distance of 10 miles above Lock 4, drowning out "Box shoals," and materially reduce the amount of channel work necessary to secure this depth. As the stability of the dam at Lock 4 is largely in excess of requirements, the increased height to the dam and lift of the lock can be made, and the 6-foot channel thus secured at a much less cost than by channel work alone.

It is recommended that a dam, at present without lock, be built at the site proposed for Lock 5, the next lock in the series, to extend navigation to this point, reaching Riverside and Coosa Valley at the crossings of the Southern and Coosa Valley railroads. This will give continuous navigation for 191 miles below Rome, Ga., through the four upper locks.

The channel from Rome, Ga., to Greensport, Ala., improved in 1876 and 1880, has again become obstructed by the total or partial destruction of the works of contraction; by the reformation of gravel and sand bars; by the snags and logs which have collected in the channel, and by the overhanging trees on the banks.

Work on this part of the river and from Greensport down to Lock 4 is needed to obtain the required low-water depth of 4 feet and width of 80 feet.

The estimate for the work recommended is as follows:

Completing Lock 4 (with height of dam and lift of lock increased 3 feet).....	\$292,000
Constructing dam at site of Lock 5.....	95,000
Continuing channel work between Rome, Ga., and Lock No. 4 .....	50,000
Total.....	437,000

It is proposed to apply the available balance to improving the channel between Rome, Ga., and Lock 4. The additional amount asked for to be applied to the further improvement and maintenance of the channel between Rome, Ga., and Lock No. 4, to completing Lock No. 4, raising the dam an additional 3 feet and increasing the lift of the lock by the same amount, and to building a dam without lock at the site proposed for Lock No. 5, the next in the series below.

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## APPROPRIATIONS.

August 14, 1876.....	\$30,000.00	August 18, 1894.....	\$110,000.00
June 18, 1877.....	75,000.00	June 3, 1896.....	50,000.00
March 3, 1879.....	45,000.00	March 3, 1899.....	20,000.00
July 14, 1880.....	75,000.00	June 13, 1903.....	<sup>a</sup> 25,000.00
March 5, 1881.....	60,000.00	June 13, 1903, amount	
August 2, 1882.....	88,700.00	made available from	
July 5, 1884.....	50,000.00	lower division of river	10,000.00
August 5, 1886.....	45,000.00	Received from sales of	
August 11, 1888.....	60,000.00	property.....	1,322.40
September 19, 1890.....	150,000.00		
July 13, 1892.....	130,000.00	Total.....	1,020,022.40

## COMMERCIAL STATISTICS.

Commercial statistics for the fiscal year ending June 30, 1903, furnished by the Georgia and Alabama Steamboat Company, of Rome, Ga., and the Lathrop-Hatten Lumber Company, of Riverside, Ala., are given in the following table:

Name and description of steamboat.	Registered tonnage.	Draft.		Number of round trips made between places named.
		Light.	Loaded.	
		Inches.	Inches.	
Stern-wheel steamboat Willie C. Wagon.	151	18	52	3; Rome, Ga., and Gadsden, Ala., and Locks Nos. 1, 2, and 3.
Stern-wheel steamboat Conasauga.	81	17	48	5; Carters, Ga., and Gadsden, Ala.
Stern-wheel steamboat Sporter.	54	12	36	

*Freight carried.*

Articles.	Quantity.	Tons.
Cotton.....	bales 8,500	2,150
Cotton seed.....	sacks 84,000	1,700
Cotton-seed meal.....	do 5,500	275
Fertilizers.....	do 21,300	2,120
Oats.....	do 5,500	450
Corn.....	do 13,700	1,100
Hay.....	bales 8,900	450
Flour.....	barrels 8,800	380
Sugar.....	do 650	120
Molasses.....	do 430	130
Bagging.....	rolls 2,250	110
Ties.....	bundles 2,700	55
General miscellaneous.....	packages 22,400	1,050
Live stock.....	head 125	60
Lumber.....	feet 9,550,000	23,875
Staves.....	pieces 250,000	250
Provisions—case goods.....	packages 2,050	7,100
Coffee.....	sacks 2,750	50
Corn meal.....	do 14,500	210
Bacon—smoked and dressed shoulder.....	boxes 2,750	140
Salt.....	sacks 4,300	430
Lard.....	packages 1,800	50
Soap.....	boxes 1,350	60
Nails.....	kegs 1,100	55
Shingles.....	M 1,125,000	210
Brick.....	do 200,000	500
Lumber—logs.....	feet 8,516,000	34,000
Total.....		77,760

Estimated value of above freights, \$1,975,548.

In addition to freight carried by steamboats, the Lathrop-Hatten Lumber Company estimate that they rafted down the river during past fiscal year, 3,500,000 feet of saw logs, valued at \$17,500.

<sup>a</sup> \$10,000 of this amount, or so much thereof as may be necessary, to be expended on Oostenaula and Coosawattee rivers, Georgia and Alabama.

## (b) COOSA RIVER BETWEEN WETUMKA AND EAST TENNESSEE, VIRGINIA AND GEORGIA RAILROAD BRIDGE—OPERATIONS DURING THE FISCAL YEAR ENDING JUNE 30, 1903.

The property belonging to the improvement was properly cared for. Such slight repairs were made to the lock house, fences, cement warehouse, and general storage sheds as were found necessary.

The money available being insufficient for other operations, it is recommended that no further work be done upon this division of the river except such as may be necessary to care for buildings and property now on hand at Wetumka, Ala., until the question of the further improvement of the Coosa River between Wetumka and the East Tennessee, Virginia and Georgia Railroad Bridge is settled.

## APPROPRIATIONS.

September 19, 1890 .....	\$150,000
July 13, 1892 .....	100,000
August 18, 1894 .....	110,000
June 3, 1896 .....	50,000
	<hr/>
	410,000
Less amount transferred by act of June 13, 1902, to upper division of the river .....	10,000
	<hr/>
Total .....	400,000

## COMMERCIAL STATISTICS.

The only commerce possible on this part of the Coosa River is the rafting of saw logs and square timber during the season when the river is about 12 feet above low water, but no reliable estimate of this commerce can be obtained.

## (c) OOSTENAULA AND COOSAWATTEE RIVERS.

For description, statements of past and present conditions and project see Annual Report of the Chief of Engineers for 1903, page 305.

Previous operations upon this river will be found in Annual Reports of the Chief of Engineers as follows: 1872, page 507; 1874, page 581; 1875, page 792; 1876, page 714; 1879, page 1271 et seq.; 1880, pages 1692-1693; 1881, pages 1873-1874.

## OPERATIONS DURING THE FISCAL YEAR ENDING JUNE 30, 1903.

The existing project is that part of the river and harbor act approved June 13, 1902, applying to these rivers, and is as follows:

Improving the Coosa River, Georgia and Alabama, and the Oostenaula and Coosawattee rivers, Georgia, thirty-five thousand dollars, of which amount ten thousand dollars, or so much thereof as may be necessary, shall be expended upon the last-named rivers.

No estimate of cost other than that quoted from the river and harbor act above was made.

The sum appropriated, or so much as may be necessary, will be expended during the next fiscal year in renewing the works of contraction, removing snags and other obstructions from the channel, and

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cutting overhanging trees from the banks where they are an obstruction to navigation.

The appropriation was too small to justify the Government in acquiring a plant for this work, and every effort to hire one for last season's operations having failed no work was done. Negotiations are now in progress for the hire of a suitable plant for this season's operations, and if these are successful, as expected, the improvement will be commenced at an early date.

In the absence of any recent examinations or surveys it is not possible to submit an exact estimate for work further than that already provided for, but there should be provided in connection with this and any future work a small light draft snag boat, suitable for towing, and two light-draft barges. This plant to be available for use on the upper Coosa River also.

The estimate for this work is as follows:

Construction of light-draft snag and tow boat .....	\$8,000
Construction of two barges .....	3,000
Operation of plant .....	6,500
<b>Total .....</b>	<b>17,500</b>

In view of small benefits to be derived from this improvement, no further appropriations are recommended at present.

*Money statement.*

July 1, 1902, balance unexpended .....	\$80,675.64
June 30, 1903, amount expended during fiscal year .....	13,459.93
July 1, 1903, balance unexpended .....	47,215.71
July 1, 1903, outstanding liabilities .....	3,770.25
July 1, 1903, balance available .....	43,445.46
Amount (estimated) required for completion of existing project .....	6,059,913.00
Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903:	
For works of improvement .....	\$387,000.00
For maintenance of improvement .....	30,000.00
	417,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

## APPROPRIATIONS.

1874 .....	\$10,000	1881 .....	\$1,000
1875 .....	5,000	1882 .....	1,000
1878 .....	4,000		
1879 .....	3,000	Total .....	26,000
1880 .....	2,000		

## COMMERCIAL STATISTICS.

Name and description of vessel.	Registered tonnage.	Draught.		No. of round trips made and between what places.
		Light.	Loaded.	
Stern-wheel steamboat Connasauga .....	81	Feet. 1.5	Feet. 4	12; Carters, Ga., and Rome, Ga.

<sup>a</sup>Oostenaula River.

*Freight carried.*

Articles.	Quantity.	Tons.
Cotton.....bales	100	25
Cotton seed.....sacks	2,000	100
Fertilizers.....do	1,000	100
Lumber.....feet	600,000	1,500
Total.....		1,725

Estimated value of above freights, \$14,000.

## S 13.

## OPERATING AND CARE OF CANALS AND OTHER WORKS OF NAVIGATION ON COOSA RIVER, GEORGIA AND ALABAMA.

Locks Nos. 1, 2, and 3 were opened to navigation June 30, 1890, and have been operated continuously, except during February, 1895, when the canal between Locks Nos. 2 and 3 was frozen over for a period of ten days. During the fiscal year ending June 30, 1899, Lock No. 3 was closed to navigation from January until June while the lock was undergoing repairs. In February, 1899, while the lock was being repaired, the temperature fell to  $-8\frac{1}{2}^{\circ}$ , the lowest recorded temperature for this locality.

The amount expended to the end of the fiscal year ending June 30, 1903, was \$129,283.61.

During the fiscal year ending June 30, 1903, the locks were operated continuously, except Lock No. 1, which was closed during a part of October and November, 1902, while the gates were being renewed.

An allotment was made July 31, 1902, which included the following work:

Repairs to dams, Locks 1 and 2.....	\$5,000
Renewal of gates, Lock 1.....	1,800
Continuing repairs to and raising dam at Lock No. 4.....	10,000
Total.....	16,800

The work of repairing and raising the crest of Dam No. 4 was finished the last of September, 1902. This work was fully described in the Report of the Chief of Engineers for 1902, pages 1278 and 1279.

Repairs were made to Dams Nos. 1 and 2. The gates at Lock No. 1 were renewed, and the entrances to Locks Nos. 1, 2, and 3 were dredged. Minor repairs were made to the lock houses.

Summary of expenditures made during the fiscal year ending June 30, 1903, at Locks Nos. 1, 2, and 3, and Dam No. 4, Coosa River, Georgia and Alabama, under the indefinite appropriation for operating and care of canals, etc.:

Services.....	\$17,759.14
Supplies, etc.....	184.86
Material.....	1,778.89
Provisions and ice.....	2,024.80
Fuel.....	752.69
Rent.....	189.34
Total.....	22,688.72



S 14.

REMOVING SUNKEN VESSELS OR CRAFT OBSTRUCTING OR ENDAN-  
GERING NAVIGATION.

The steamer *C. Emlin*, which was burned and sunk in the channel opposite the town of Apalachicola, Fla., having been reported as an obstruction to navigation, with approval of the Secretary of War notice was sent the owners to remove the same. They reported that they wished to do so, but subsequently they reported that they had removed the machinery and abandoned that portion of the vessel which remains. The removal of this obstruction will therefore be undertaken as soon as a contract after advertisement can be made.

## APPENDIX T.

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### IMPROVEMENT OF RIVERS AND HARBORS IN WESTERN ALABAMA AND EASTERN MISSISSIPPI.

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*REPORT FOR THE FISCAL YEAR ENDING JUNE 30, 1903, WITH OTHER  
DOCUMENTS RELATING TO THE WORKS. OFFICERS IN CHARGE,  
CAPT. SPENCER COSBY AND CAPT. W. E. CRAIGHILL, CORPS OF  
ENGINEERS.*

#### IMPROVEMENTS.

- |   |   |
|---|---|
| 1. Harbor at Mobile, Alabama.   | 6. Harbor at Biloxi, Mississippi.   |
| 2. Black Warrior, Warrior, and Tom-<br>bigbee rivers, Alabama and Mis-<br>sissippi. | 7. Channel from Gulfport to Ship Island<br>Harbor, Mississippi.                     |
| 3. Operating and care of locks and dams<br>on Black Warrior River, Alabama.         | 8. Pearl River below Rockport, Missis-<br>sippi.                                    |
| 4. Pascagoula River and Horn Island<br>Harbor, Mississippi.                         | 9. Pearl River between Edinburg and<br>Jackson, Mississippi.                        |
| 5. Pascagoula, Chickasahay, and Leaf<br>rivers, Mississippi.                        | 10. Removing sunken vessels or craft<br>obstructing or endangering naviga-<br>tion. |
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UNITED STATES ENGINEER OFFICE,  
*Mobile, Ala., July 20, 1903.*

GENERAL: I have the honor to forward herewith my annual reports  
for the fiscal year ending June 30, 1903, for the works of rivers and  
harbors under my charge.

Very respectfully, your obedient servant,

W. E. CRAIGHILL,  
*Captain, Corps of Engineers.*

Brig. Gen. G. L. GILLESPIE,  
*Chief of Engineers, U. S. A.*

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#### T 1.

#### IMPROVEMENT OF HARBOR AT MOBILE, ALABAMA.

An account of this improvement is contained in the Annual Reports  
of the Chief of Engineers for 1896, page 1425, and 1900, page 2161.

During the past fiscal year available funds have been applied to the  
work of dredging a 23-foot channel in Mobile River and Bay and to

the work of removing sunken logs, trees, and other dangerous obstructions from the channel of Mobile River in front of the city of Mobile.

Dredging operations have been carried on under contract, dated October 28 and approved November 18, 1902, with the National Dredging Company, of Wilmington, Del. Work under this contract commenced on November 25, 1902, and is still in progress. Up to June 30, 1903, a total of 2,409,939 cubic yards of material, scow measurement, had been removed under this contract, completing a channel with a least width of 100 feet, a least depth of 23 feet, and with an aggregate length of about 15 miles in Mobile River and the upper portion of Mobile Bay.

During the months of March and April, 1903, the snag boat *Tom-higbee* was engaged in the work of removing sunken logs, timbers, and similar obstructions from the channel of Mobile River, between the mouth of Chickasaw Creek and the head of Mobile Bay. These operations resulted in placing the river within the limits of the project in a safe condition for deep-draft navigation.

The work of widening and deepening the channel through the outer bar near Fort Morgan, for which provision was made in the river and harbor act of June 13, 1902, has not yet been commenced as suitable plant for this work could not be obtained.

Recent examinations show that the dredged channel in Mobile Bay tends to shoal up rapidly, and that the cost of maintaining this channel with present methods will probably be greater than was estimated in the report upon the survey on which the existing project is based. A considerable economy, as well as greater efficiency would result from removing the shoal places in the channel as fast as they form instead of doing the work at long intervals, as has been necessary in the past on account of lack of money. Funds for maintenance should be provided so as to make this possible. The greatest economy would be attained by a dredge owned by the United States, to be used chiefly for maintenance, reserving additional work of enlargement that may be authorized to be done by present methods.

The effective maintenance of the channel through the outer bar beyond Fort Morgan, and the channels through Horn Island and Ship Island passes, if provision is made in the future for the latter works, will require the use of Government plant. It is therefore recommended that in future appropriations for Mobile Harbor provision be made for the construction of a suitable dredging plant for this district. It is further recommended that the application of a portion of future appropriations to the work of rectifying the alignment of the channel from the mouth of Mobile River to Light-House Beacon 16, chiefly by widening and easing the bends in the present channel, be authorized. The channel between these points has some difficult bends that can be greatly improved by a modern amount of dredging.

It is proposed during the coming fiscal year to apply available funds to the continuation of dredging work in Mobile Harbor under the existing contract; to perform necessary work of removing obstructions from Mobile River after the coming winter freshets, and to commence dredging work on the outer bar, if suitable plant can be secured for this work.

The report of Mr. David G. Anderson, assistant engineer, giving details pertaining to this work of improvement, is appended.

*Money statement.*

July 1, 1902, balance unexpended.....	\$300,354.61
Amount appropriated by sundry civil act approved March 3, 1903.....	200,000.00
	<hr/>
June 30, 1903, amount expended during fiscal year.....	500,354.61
	168,743.36
	<hr/>
July 1, 1903, balance unexpended.....	331,611.25
July 1, 1903, outstanding liabilities.....	67,906.29
	<hr/>
July 1, 1903, balance available.....	263,704.96
	<hr/>
July 1, 1903, amount covered by uncompleted contracts.....	173,475.00
	<hr/>
{ Amount (estimated) required for completion of existing project.....	<sup>a</sup> 641,250.00
{ Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903:	
For works of improvement.....	\$641,250.00
For maintenance of improvement.....	125,000.00
	<hr/>
{ Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	766,250.00

## APPROPRIATIONS.

By act of—		
May 20, 1826.....	\$10,000.00	
March 2, 1829.....	20,000.00	
June 24, 1834.....	10,000.00	
March 3, 1835.....	17,997.60	
March 3, 1837.....	50,000.00	
July 7, 1838.....	50,000.00	
August 3, 1852.....	50,000.00	
	<hr/>	\$207,997.60
March 3, 1857 (relief claim).....		20,833.08
July 11, 1870.....	50,000.00	
March 3, 1871.....	50,000.00	
June 10, 1872.....	75,000.00	
March 3, 1873.....	100,000.00	
June 23, 1874.....	100,000.00	
March 3, 1875.....	26,000.00	
	<hr/>	401,000.00
June 18, 1878 (survey).....	10,000.00	
March 3, 1879.....	100,000.00	
June 14, 1880.....	125,000.00	
March 3, 1881.....	100,000.00	
August 2, 1882.....	125,000.00	
July 5, 1884.....	200,000.00	
August 6, 1886.....	90,000.00	
	<hr/>	750,000.00
August 11, 1888.....	250,000.00	
September 19, 1890.....	350,000.00	
July 13, 1892.....	212,500.00	
March 3, 1893.....	500,000.00	
August 18, 1894.....	390,000.00	
March 2, 1895.....	291,300.00	
March 16, 1896.....	160,000.00	

<sup>a</sup> Balance necessary to complete appropriations to the amount of \$1,640,000, the estimated cost of Mobile Harbor project.....	\$540,000
Amount diverted from appropriation of June 13, 1902, to be applied to snagging work and outer-bar dredging.....	60,000
Balance necessary to complete appropriations to the amount of \$91,250, the estimated cost of the outer-bar dredging.....	41,250
	<hr/>
	641,250

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By act of—

June 3, 1896 (maintenance) .....	\$60,000.00
June 4, 1897 (maintenance) .....	25,000.00
July 1, 1898 (maintenance) .....	30,000.00
	<u>\$2,268,800.00</u>
March 3, 1899 .....	100,000.00
June 6, 1900 .....	500,000.00
June 13, 1902 .....	300,000.00
March 3, 1903 .....	200,000.00
	<u>1,100,000.00</u>
Total .....	4,748,630.68

## CONTRACT IN FORCE.

With the National Dredging Company, dated October 28, 1902; approved by the Chief of Engineers November 18, 1902, for dredging in Mobile River and Bay, Alabama, at the rate of 8.3 cents per cubic yard for material removed, measured in scows; work commenced November 25, 1902; continuing contract, to be completed by April 30, 1904.

## COMMERCIAL STATISTICS.

[Statistics furnished by the United States custom-house, Mobile, Ala., showing the business of the port of Mobile for the calendar year ending December 31, 1902.]

Exports .....	\$11,989,917
Imports (valuation at point of shipment) .....	4,584,548
Total .....	16,574,465

Trade.	Vessels.			
	Entered 1902.		Cleared 1902.	
	Number.	Tons. <sup>a</sup>	Number.	Tons. <sup>a</sup>
Foreign .....	663	479,633	666	496,566
Coastwise .....	78	109,869	93	98,541
Total .....	741	589,502	751	595,107

<sup>a</sup> Registered net tonnage.

## Foreign commerce.

The following statement concerning the foreign commerce of the port of Mobile for the calendar year ending December 31, 1902, has been compiled from the records of the United States custom-house and from the reports of shippers, consignees, and carriers:

Articles.	Tons.	Value.
EXPORTS.		
Live stock .....	7,450	\$588,214
Breadstuffs .....	36,694	1,352,234
Coal and coke .....	14,199	58,190
Cotton .....	20,440	3,660,287
Hog products .....	9,045	1,780,413
Timber .....	416,022	2,092,149
Lumber .....	126,737	1,409,906
Manufactures .....	12,410	838,765
Miscellaneous .....	8,871	214,760
Total .....	651,868	11,989,917

Articles.	Tons.	Value.
<b>IMPORTS.</b>		
Bananas .....	62, 866	\$1, 065, 181
Cocoanuts, etc .....	3, 444	128, 829
Sisal grass .....	19, 331	3, 822, 313
Hard wood .....	1, 568	122, 133
Sulphur ore .....	22, 486	108, 059
Manganese ore .....	24, 158	228, 946
Miscellaneous .....	12, 202	260, 274
Total .....	146, 055	5, 730, 685

The following lines of steamships operate between Mobile, Ala., and foreign ports:  
 United Fruit Company, Central American ports.  
 Orr-Laubenheimer Steamship Company, Central American ports.  
 Camors-McConnell Steamship Company, Central American ports.  
 John B. Cefalu & Co., Central American ports.  
 Central American Steamship Company, Central American ports.  
 Southern Steamship Company, Central American ports.  
 Bluefields Steamship Company, Central American ports.  
 Munson Line, Cuban ports.  
 Atlantic and Mexican Gulf Steamship Company, Mexican ports.  
 Benemelis Line, Mexican ports.  
 Elder-Dempster Company, United Kingdom and Continent.  
 International Steamship Company, all ports.

*Coastwise and domestic commerce.*

The following statement concerning the coastwise and domestic commerce of the port of Mobile for the calendar year ending December 31, 1902, has been compiled from the records of shippers, consignees, and carriers:

Articles.	Tons.	Value.
<b>ARRIVING.</b>		
Cotton .....	14, 284	\$2, 650, 682
Logs .....	413, 667	1, 184, 904
Fish and oysters .....	28, 380	675, 000
Cord wood .....	77, 310	90, 210
Naval stores .....	12, 960	493, 961
Staves, etc .....	13, 063	120, 962
Cross-ties .....	4, 655	183, 005
Miscellaneous .....	30, 500	305, 000
Total .....	594, 819	5, 708, 724
<b>DEPARTING.</b>		
Coal (bunker) .....	180, 000	530, 000
Cotton .....	6, 843	1, 265, 012
Phosphate .....	10, 000	150, 000
Lumber .....	20, 136	202, 968
Cross-ties .....	4, 098	16, 170
Miscellaneous .....	132, 400	3, 977, 050
Total .....	353, 477	6, 141, 200

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*Comparative statement of the number and draft of vessels passing up and down the dredged channel for the calendar years ending December 31, 1901 and 1902.*

[Compiled from the books of the harbor master at Mobile, Ala.]

Draft.	Steamships.				Square-rigged vessels.			
	Up.		Down.		Up.		Down.	
	1901.	1902.	1901.	1902.	1901.	1902.	1901.	1902.
Less than 13 feet.....	352	351	189	222	63	46	2	6
13 to 14 feet.....	156	109	71	71	30	20	2	3
14 to 15 feet.....	44	48	89	98	25	13	6	4
15 to 16 feet.....	8	26	57	30	15	4	13	4
16 to 17 feet.....	2	10	36	22	4	1	8	2
17 to 18 feet.....		8	27	21		1	9	8
18 to 19 feet.....	6	9	21	29	1		19	10
19 to 20 feet.....	2	2	24	22		2	8	10
20 to 21 feet.....	1		31	25		1	18	16
21 to 22 feet.....	1	2	11	18			31	14
22 to 23 feet.....		1	12	8			22	11
Total.....	572	566	572	566	138	88	138	88

Draft.	Schooners and sea-going barges.				Total.			
	Up.		Down.		Up.		Down.	
	1901.	1902.	1901.	1902.	1901.	1902.	1901.	1902.
Less than 13 feet.....	155	142	97	84	570	539	288	312
13 to 14 feet.....	2	2	19	15	188	131	92	89
14 to 15 feet.....	1	2	1	24	70	63	96	126
15 to 16 feet.....	4		2	8	27	30	72	42
16 to 17 feet.....	1	1	5	8	7	12	49	32
17 to 18 feet.....		1	25	5		10	61	34
18 to 19 feet.....	2		4	1	9	9	44	40
19 to 20 feet.....	1	1	11	1	3	5	47	33
20 to 21 feet.....	1		2	2	2	1	51	43
21 to 22 feet.....			1	1	1	2	43	33
22 to 23 feet.....						1	34	19
Total.....	167	149	167	149	877	803	877	803

REPORT OF MR. DAVID G. ANDERSON, ASSISTANT ENGINEER.

MOBILE, ALA., June 30, 1903.

CAPTAIN: I have the honor to submit the following report of operations accomplished during the fiscal year ending June 30, 1903, in connection with the improvement of Mobile Harbor, Alabama.

The river and harbor act of June 13, 1902, authorized the expenditure of \$500,000 on operations in connection with the improvement of Mobile Harbor, appropriations to this amount being carried by that act and by the sundry civil act of March 3, 1903. By the provisions of the act of June 13, 1902, these appropriations were to be applied to the following operations:

- (1) The formation of a 23-foot channel in Mobile River and Bay.
- (2) The removal of sunken logs and similar obstructions from the channel of Mobile Harbor.
- (3) The widening and deepening of the channel through the outer bar near Fort Morgan.

The project for the expenditure of available and authorized funds approved July 21, 1902, provided for the application of \$440,000 to the work of widening and deepening the existing channel in Mobile River and Bay to its projected dimensions (23 feet deep at low water over a width of 100 feet, with appropriate side slopes); the application of \$10,000, or so much thereof as might be necessary, to the work of removing sunken logs and other obstructions from Mobile Harbor, and the application of \$50,000, or so much thereof as might be necessary, to the work of dredging the channel through the outer bar near Fort Morgan to a depth not exceeding 30 feet and to as great a width as possible not exceeding 300 feet.

## THE FORMATION OF A 23-FOOT CHANNEL IN MOBILE RIVER AND BAY.

(a) *Survey work.*—At the close of the fiscal year of 1902, a triangulation survey of Mobile Harbor was in progress to establish permanent stations for the future control of sounding and dredging work, and to develop the existing condition of the ship channel. This survey was completed in September, 1902, and in addition to triangulation work extending from Fort Morgan to Choctaw Point, a distance of about 30 miles, it included a stadia traverse on the Mobile River from Choctaw Point to Chickasaw Creek, the upper limit of the Mobile Harbor project, a farther distance of 5 miles, together with the complete hydrography of the ship channel and its vicinity.

(b) *Tidal observations.*—The low-water plane in use at present on Mobile Harbor is based on the results of about 40 low-water readings observed at Mobile, Ala., by the United States Coast and Geodetic Survey in 1860. From a recent comparison of this plane and the plane of low water in the Gulf of Mexico at Biloxi, Miss., based on observations of the Mississippi River Commission, it appears that the former datum is 0.281 of a foot below the latter, and the low-water plane now in use is therefore probably in error to at least this amount.

For the purpose of securing data upon which to base the correction of the low-water plane, an automatic tide gauge was installed on the wharf of the Battery Gladden light-house on January 2, 1903. This gauge has furnished practically a continuous record since that time, and from the data thus obtained up to June 30, 1903, the following approximate results have been deduced:

	Feet.
Average of 168 high waters above present datum .....	2.05
Average of 169 low waters above present datum .....	.58
Average range of tide .....	1.47

These results also seem to show that the adopted plane of low water is too low, although reliable data for its correction can not be obtained in less than one year, owing to the fact that the low waters of winter are much lower than those of the summer season.

(c) *Dredging.*—A contract with the National Dredging Company to dredge the channel to 23 feet was approved by the Chief of Engineers November 18, 1902, the price being 8.3 cents per cubic yard, measured in scows.

Work under this contract was commenced on November 25, 1902, and is still in progress. Detailed information in regard to the results accomplished are shown in the following table:

Name of dredge.	Commenced work—	Dredged to June 30, 1903.	Average yardage per working day.	Advance to June 30, 1903.	Advance per working day.
		<i>Cubic yds.</i>		<i>Feet.</i>	<i>Feet.</i>
Grapple No. 5 .....	Nov. 25, 1902	1,437,188	8,929	39,093	218
Hydraulic No. 5 .....	Dec. 16, 1902	877,646	5,418	38,853	239
Grapple Mascot .....	June 16, 1903	95,105	7,316	2,357	181
Total .....		2,409,939		80,303	

The following sections of the channel have been dredged to a least depth of 23 feet, and to a least width of about 100 feet:

	Feet.
Above One-mile Creek to Elmira street, Mobile .....	14,006
Delaware street, Mobile, to beacon 20 .....	5,210
Beacon 20 to 3,300 feet south of beacon 16 .....	19,637
Beacon 14 to 2,357 feet south of beacon 12 A .....	10,621
Beacon 12 to 350 feet north of beacon MB A .....	30,194
Beacon 6 to 635 feet south of beacon 6 .....	635
Total .....	80,303

The comparatively small output of the hydraulic dredge is due to the light bank in which this machine has been working for the greater part of the time. The amount of time which has been lost by all these machines is practically one-third of the total available working time.

During the coming fiscal year it is proposed to apply available funds to payments for work under the existing contract with the National Dredging Company and to the necessary work of inspection and surveys.



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### REMOVING OBSTRUCTIONS FROM MOBILE HARBOR.

The snag boat *Tombigbee* was placed in commission on the work of removing sunken logs and similar obstructions from Mobile River on March 9, 1903, and continued operations until the end of April. During this time the snag boat worked over the entire river from the mouth of Chickasaw Creek to the head of the bay and placed the ship channel within these limits in a safe condition for navigation.

A portion of available funds has also been applied to the repair of the plant which has been or will be used on this work.

It is proposed to apply available funds during the coming year to the continuation of the work of repairing plant and to the further prosecution of the operations of removing obstructions which may be brought into the ship channel during the coming season of high water.

### DREDGING ON OUTER BAR.

A survey of the outer bar of Mobile Harbor beyond Fort Morgan was completed in August and September, 1902, and the proposed work of dredging at this locality was advertised under date of October 13, 1902, but no proposals were received in response to this advertisement. As no suitable private plant was available for this work, and as subsequent efforts to secure Government plant for its execution proved unsuccessful, no operations of dredging at this locality have yet been undertaken.

It is proposed during the coming fiscal year to undertake the work of dredging on the outer bar if a suitable plant for this work can be obtained.

Recent surveys show that the annual cost of maintaining the Mobile Harbor channel will probably be between \$100,000 and \$125,000 instead of \$60,000 as originally estimated, if the present methods of work are followed.

Respectfully submitted.

DAVID G. ANDERSON,  
*Assistant Engineer.*

Capt. W. E. CRAIGHILL,  
*Corps of Engineers.*

### T 2.

### IMPROVEMENT OF BLACK WARRIOR, WARRIOR, AND TOMBIGBEE RIVERS, ALABAMA AND MISSISSIPPI.

### PROJECT FOR BLACK WARRIOR, WARRIOR AND TOMBIGBEE RIVERS, ALABAMA.

To afford a channel for 6-foot navigation from the junction of the Mulberry and Locust forks of the Black Warrior River to the mouth of the Tombigbee River, a distance of 362 miles, by the construction of locks and dams and other necessary work. Locks are to be 52 feet wide and 322 feet between gates, giving an available length of 285 feet; minimum depth of water on miter sills, 6½ feet, and 7 feet in lock chambers and approaches.

#### (a) BLACK WARRIOR RIVER.

[Above Tuscaloosa, Ala.]

The following work was done by the contractors during the year:

Quoins.....	cubic yard..	1
Coping .....	cubic yards..	39
Pointed face masonry.....	do.....	192
Rock face masonry.....	do.....	36
Rubble masonry .....	do.....	2, 893
Dry rubble masonry.....	do.....	64
Excavation .....	do.....	2, 834
Rock excavation .....	do.....	438
Embankment.....	do.....	544
Stone filling .....	do.....	440
Riprap, hand placed .....	do.....	478
Framed timber.....	feet B. M..	8, 814
Grubbing and clearing .....	per cent..	30

## PRESENT CONDITION OF WORK.

Three locks completed, one lock 80 per cent finished, and 7 locks not begun.

## GATES.

Gates and valves for Lock 4 were built with hired labor at the Tuscaloosa shops and are stored ready for erection whenever the contract work is sufficiently advanced.

With available funds it is proposed to complete work on Lock and Dam No. 4, and with future appropriations to carry the work of lock and dam construction on up the river.

## NAVIGATION AND COMMERCE.

The bulk of the traffic on this part of the river passes through Locks 1, 2, and 3, and is given in detail in the report on operating and care of locks and dams, Black Warrior and Warrior rivers, Alabama. In addition to this there is a small traffic in coal and timber on the pool above Lock 3, statistics of which are not available.

## (b) WARRIOR RIVER.

[Below Tuscaloosa, Ala.]

## WORK OF THE PAST YEAR.

Locks 1, 2, and 3, on the lower portion of the stream, were begun under contract early in May, 1903. On June 30, 1903, the following work had been accomplished on these locks:

	Lock 1.	Lock 2.	Lock 3.
Grubbing and clearing.....acres..	7	9	11
Excavated material.....cubic yards..	16,000	.....	9,000
Foundation piles, delivered.....linear feet..	617	702	553
Foundation piles, driven.....do....	64	.....	220

Contract work on Lock 4 was continued, with about five months intermission, owing to floods during the winter and spring. On June 30, 1903, contract work on this lock was about 95 per cent completed. Contract work on Locks 5 and 6 was completed, and the locks turned over to the United States in December, 1902. The following work was done by the contractors on these locks during the year:

	Lock 4.	Lock 5.	Lock 6.
Concrete.....cubic yards..	6,635	1,989	676
Excavation.....do.....	59,293	38,163	32,025
Gravel filling.....do.....	995	2,113	1,788
Puddling.....do.....	.....	35,742	.....
Stone filling.....do.....	.....	2,823	2,273
Riprap.....do.....	694	1,965	1,760
Mattress work.....square yards..	307	.....	.....
Miter sills.....feet B. M..	1,282	.....	.....
Dam timber.....do.....	14,063	228,198	187,008
Apron timber.....do.....	36,828	80,392	69,961
Floor timber.....do.....	90,282	68,443	.....
Sheathing.....do.....	1,133	6,018	.....
Sheet piling.....do.....	165,219	84,761	58,158
Foundation piles.....linear feet..	4,526	1,104	1,528
Foundation piles, cut off.....do.....	3,722	429	528
Heart piles.....do.....	3,061	3,343	3,345
Heart piles, cut off.....do.....	332	497	415
Drain pipe.....do.....	413	104	121
Grubbing and clearing.....per cent..	.....	20	6

## PRESENT CONDITION OF WORK.

One lock completed and in operation, one lock 95 per cent completed, one lock completed except slight work on gates, and three locks just begun.

## GATES.

Gates and valves for Locks 4, 5, and 6 were built with hired labor at the Tuscaloosa shops and are being erected with hired labor. Erection of the gates and valves at Lock 6 was finished in October, 1902, and the lock has since been operated regularly. Erection of gates and valves at Lock 5 was nearly completed in December, 1902, when interrupted by high water, and has not since been resumed. Gates and valves have been delivered at Lock 4, and are to be erected when the contract work is sufficiently advanced.

With available funds and additional appropriations it is proposed to build Locks and Dams Nos. 1, 2, and 3, and to complete work on Lock No. 4.

Snagging operations on the Warrior River were commenced on May 27, 1903, about 4 miles below Lock No. 4. During the balance of May and the month of June a distance of about 14½ miles of the river below Lock No. 4 was worked over by the snag boat *Demopolis* and placed in a safe condition for navigation.

## NAVIGATION AND COMMERCE.

A portion of the traffic on this stream passed Locks 5 and 6, and is given in detail in the reports on operating and care of locks and dams, Black Warrior and Warrior rivers, Alabama. In addition to this, there was some navigation and considerable rafting on that portion of the river below Lock 5, statistics of which are not available.

## (c) TOMBIGBEE RIVER.

## WORK OF THE PAST YEAR.

Operations were largely confined to a survey to determine the cost of completing Lock 1, the location and cost of constructing Locks 2 and 3, and the amount and cost of necessary dredging.

## PRESENT CONDITION OF WORK.

One lock is about two-thirds completed, and two locks and the work of dredging have not yet been commenced. The survey has been almost completed. With available funds it is proposed to complete the survey hereinbefore mentioned.

For commercial statistics for the calendar year ending December 31, 1902, see report on improvement of Tombigbee River, mouth to Demopolis, page 1249.

## GENERAL.

In order to open navigation from tide water to the Warrior coal fields, and to make available the work already done in the rivers, provision should be made for the immediate completion of Lock and Dam

No. 1, Tombigbee River (at McGrews shoals), and for putting under contract the remaining two locks and dams on this river. This, with the works already completed or in progress, will provide continuous slack-water navigation from Mobile to a point about 13 miles above Tuscaloosa. In addition, two more locks and dams above Tuscaloosa should be provided for in order to extend navigation 25 miles into the coal fields. For reasons of economy, contracts should be authorized for the completion of the locks and dams named above.

*Money statement.*

July 1, 1902, balance unexpended .....	\$740, 483. 51
Amount appropriated by sundry civil act approved March 3, 1903 .....	200, 000. 00
	<hr/>
	940, 483. 51
June 30, 1903, amount expended during fiscal year .....	307, 638. 58
	<hr/>
July 1, 1903, balance unexpended .....	632, 844. 93
July 1, 1903, outstanding liabilities .....	34, 637. 00
	<hr/>
July 1, 1903, balance available .....	598, 207. 93
	<hr/>
July 1, 1903, amount covered by uncompleted contracts .....	749, 033. 00
	<hr/>
{ Amount (estimated) required for completion of existing project .....	Indefinite.
{ Amount that can be profitably expended in fiscal year ending June 30,	
1905, in addition to the balance unexpended July 1, 1903:	
For works of improvement .....	\$800, 000. 00
For maintenance of improvement .....	10, 000. 00
	<hr/>
	810, 000. 00
{ Submitted in compliance with requirements of sundry civil act of June	
4, 1897, and of section 7 of the river and harbor act of 1899.	

## APPROPRIATIONS.

## For Black Warrior River:

## By act of—

July 5, 1884 .....	\$50, 000. 00
August 1, 1886 .....	56, 250. 00
August 11, 1888 .....	100, 000. 00
September 19, 1890 .....	150, 000. 00
July 13, 1892 .....	200, 000. 00
August 18, 1894 .....	37, 500. 00
June 3, 1896 .....	10, 000. 00
March 3, 1899 .....	50, 000. 00
June 6, 1900 .....	86, 824. 00
March 3, 1901 .....	53, 676. 00

Amount transferred from Warrior River appropriation by act of June 13, 1902 .....

14, 000. 00  
\$808, 250. 00

## For Warrior and Tombigbee rivers:

## By act of—

March 3, 1875 .....	25, 000. 00
August 14, 1876 .....	15, 000. 00
June 18, 1878 .....	28, 000. 00
March 3, 1879 .....	20, 000. 00

88, 000. 00

## For Warrior River:

## By act of—

June 14, 1880 .....	20, 000. 00
March 3, 1881 .....	10, 622. 00
August 2, 1882 .....	10, 000. 00
July 5, 1884 .....	12, 000. 00
August 5, 1886 .....	18, 750. 00

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## For Warrior River—Continued

### By act of—

August 11, 1888.....	\$18,000.00
September 19, 1890.....	45,000.00
July 13, 1892.....	75,000.00
August 18, 1894.....	40,000.00
June 3, 1896.....	70,000.00
March 3, 1899.....	220,000.00
June 6, 1900.....	200,000.00
March 3, 1901.....	240,000.00
June 6, 1900 (emergency act, allotted).....	3,691.24
June 13, 1902.....	374,000.00
March 3, 1903.....	200,000.00

1,557,063.24

Less amount transferred to Black Warrior River improvement by act of June 13, 1902.....

14,000.00

\$1,543,063.24

## For Tombigbee River:

### By act of—

July 13, 1892.....	<sup>a</sup> 50,000.00
August 18, 1894.....	<sup>a</sup> 50,000.00
June 3, 1896.....	<sup>a</sup> 50,000.00
March 3, 1899.....	50,000.00

200,000.00

Total..... 2,839,313.24

## CONTRACTS IN FORCE.

With Willard & Cornwell, dated September 28, 1899, approved by the Chief of Engineers November 2, 1899, for the construction of Lock and Dam No. 4, Black Warrior River, Alabama, for \$163,348. Work commenced November 20, 1899; continuing contract; was to be completed by December 31, 1902, the time having been extended for one year, but time of completion has since been extended for such period as is deemed advisable by the district engineer officer.

With Christie, Lowe & Heyworth, dated February 19, 1900, approved by the Chief of Engineers March 10, 1900, for the construction of Locks and Dams Nos. 4, 5, and 6, Warrior River, Alabama, for \$149,454.40, \$132,135.40, and \$135,640.40, respectively. Work commenced April 5, 1900; continuing contract; to be completed by December 31, 1903, time of completion having been extended two years.

Supplemental contract with Christie, Lowe & Heyworth, dated April 29, 1902, approved by the Chief of Engineers May 22, 1902, for increase in materials to be furnished in the construction of Locks and Dams Nos. 4, 5, and 6, Warrior River, Alabama, and for the increase in price of excavation at Lock No. 5.

With M. T. Lewman & Co., dated April 1, 1903, approved by the Chief of Engineers April 22, 1903, for the construction of Locks and Dams Nos. 1, 2, and 3, Warrior and Tombigbee rivers, Alabama, for \$266,414, \$215,641, and \$235,436, respectively. Work commenced early in May, 1903; continuing contract; to be completed by October 1, 1905.

## (d) TOMBIGBEE RIVER, MOUTH TO DEMOPOLIS.

The river and harbor act of 1902 modified the project for this section of the Tombigbee River so as to make the work of lock and dam construction a part of the project for the improvement of the Black Warrior, Warrior, and Tombigbee rivers, Alabama. The existing proj-

<sup>a</sup>Portions of Tombigbee River appropriations applied to work of lock and dam construction.

ect for the section of the Tombigbee River between the mouth and Demopolis therefore includes only the work of maintaining the channel improved under earlier appropriations.

Available funds have been applied during the past fiscal year to the repair of plant and to snagging work. Between August 27, 1902, and June 30, 1903, a distance of 107 miles of river was worked over by the snag boats *Demopolis* and *Tombigbee* and placed in a safe condition for navigation.

It is proposed to continue snagging operations in this section of the river during the coming fiscal year.

*Money statement.*

July 1, 1902, balance unexpended .....	\$16,000.00
June 30, 1903, amount expended during fiscal year .....	11,443.27
July 1, 1903, balance unexpended .....	4,556.73
July 1, 1903, outstanding liabilities .....	787.00
July 1, 1903, balance available .....	3,769.73
<div> <div> Amount that can be profitably expended in fiscal year ending June 30, 1905, for maintenance of improvement, in addition to the balance unexpended July 1, 1903..... </div> <div>30,000.00</div> </div> Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

APPROPRIATIONS.

September 19, 1890.....	\$55,000.00
July 13, 1892.....	<sup>a</sup> 75,000.00
August 18, 1894.....	<sup>a</sup> 25,000.00
June 3, 1896.....	<sup>a</sup> 25,000.00
June 13, 1902 (allotment).....	16,000.00
Allotted from emergency act of June 6, 1900 .....	3,980.81
Total.....	199,980.81

COMMERCIAL STATISTICS FOR THE CALENDAR YEAR ENDING DECEMBER 31, 1902.

Articles.	1902.	
	Tons.	Value.
Cotton .....	6,590	\$1,222,810
Breadstuffs.....	10,800	279,200
Logs, timber, hardwood, cord wood .....	160,000	800,000
Phosphate .....	5,000	75,000
General merchandise.....	46,160	1,250,000
Steel .....	234	6,804
Machinery .....	50	5,000
Gravel and stone .....	4,150	5,300
Total.....	232,984	3,614,114

(c) DEMOPOLIS TO COLUMBUS.

During the past year, between October 1, 1902, and June 30, 1903, the snag boat *Vienna* has been engaged in the work of maintaining the

<sup>a</sup> Portions of Tombigbee River appropriations applied to snagging work.

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river channel between Demopolis and Columbus whenever the stage of water permitted. During this interval a distance of 60½ miles of this stream was worked over and restored to its improved condition. The balance of funds will be applied during the coming year to the further prosecution of snagging work within these limits. A portion of this section of the river is still very much obstructed by snags and fallen trees.

*Money statement.*

July 1, 1902, balance unexpended .....	\$12,543.11
June 30, 1903, amount expended during fiscal year .....	6,086.77
July 1, 1903, balance unexpended .....	6,456.34
July 1, 1903, outstanding liabilities .....	564.00
July 1, 1903, balance available .....	5,892.34
Amount that can be profitably expended in fiscal year ending June 30, 1905, for maintenance of improvement, in addition to the balance unexpended July 1, 1903 .....	
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	20,000.00

APPROPRIATIONS.

By act of—	
September 19, 1890.....	\$15,000
July 13, 1892 .....	35,000
August 18, 1894 .....	50,000
June 3, 1896 .....	50,000
March 3, 1899.....	10,000
Total .....	160,000

COMMERCIAL STATISTICS FOR THE CALENDAR YEAR ENDING DECEMBER 31, 1902.

Articles.	1902.	
	Tons.	Value.
Cotton .....	2,275	\$376,210
Breadstuffs .....	2,700	69,806
Cotton seed .....	1,500	90,000
General merchandise .....	7,540	171,000
Provisions .....	8,000	75,000
Logs and timber.....	40,000	240,000
Total .....	57,015	1,022,016

(f) COLUMBUS TO WALKERS BRIDGE.

The river and harbor act of June 13, 1902, consolidated the improvement of the two upper sections of the Tombigbee River, one between Columbus and Fulton and the other between Fulton and Walkers Bridge, for which separate appropriations had previously been made.

An allotment not to exceed \$4,000 for the improvement of the river between Columbus and Walkers Bridge was provided in the appropriation for improving Tombigbee River, mouth to Demopolis, and the

approved project for the expenditure of available funds contemplates the expenditure of this amount on the work of improvement.

During the past fiscal year funds have been applied to the purchase of plant and to the prosecution of snagging work. As a result of the latter a stretch of 16 miles of river above Aberdeen, Miss., was thoroughly cleared of snags, logs, overhanging trees, and other obstructions.

It is proposed to continue snagging operations in this section of the Tombigbee River during the coming fiscal year as far as available funds will permit.

The report of Mr. David G. Anderson, assistant engineer, on the improvement of Tombigbee River, Alabama, and Mississippi, is appended.

*Money statement.*

July 1, 1902, balance unexpended.....	\$4,000.00
July 30, 1903, amount expended during fiscal year .....	966.79
July 1, 1903, balance unexpended.....	3,033.21
July 1, 1903, outstanding liabilities .....	410.00
July 1, 1903, balance available .....	2,623.21
Amount that can be profitably expended in fiscal year ending June 30, 1905, for maintenance of improvement, in addition to the balance unexpended July 1, 1903 .....	
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	10,000.00

APPROPRIATIONS.

For Tombigbee River, Fulton to Columbus:

By act of—

July 13, 1892.....	\$6,000
August 18, 1894 .....	4,000
June 3, 1896 .....	8,000
March 3, 1899.....	5,000
	\$23,000

For Tombigbee River, Walkers Bridge to Fulton:

By act of—

August 11, 1888 .....	4,000
September 19, 1890 .....	4,000
July 13, 1892 (maintenance).....	3,000
August 18, 1894 (maintenance).....	1,000
June 3, 1896 (maintenance).....	1,000
March 3, 1899 (maintenance).....	1,000
	14,000

For Tombigbee River, Columbus to Walkers Bridge:

By act of June 13, 1902 (allotment) .....	4,000
Total.....	41,000

COMMERCIAL STATISTICS FOR THE CALENDAR YEAR ENDING DECEMBER 31, 1902.

Articles.	1902.	
	Tons.	Value.
Logs and timber .....	225,000	\$450,000



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REPORT OF MR. DAVID G. ANDERSON, ASSISTANT ENGINEER.

MOBILE, ALA., June 30, 1903.

CAPTAIN: I have the honor to submit the following report upon operations accomplished during the fiscal year ending June 30, 1903, in connection with the improvement of the Tombigbee River, Alabama and Mississippi. This improvement is divided into three sections, as follows:

Tombigbee River, mouth to Demopolis, Ala.

Tombigbee River, Demopolis to Columbus, Ala. and Miss.

Tombigbee River, Columbus to Walkers Bridge, Mississippi.

### MOUTH TO DEMOPOLIS.

The river and harbor act of June 13, 1902, appropriated \$20,000 for the improvement of the Tombigbee River, mouth to Demopolis, with the provision that \$4,000 of this amount, or so much thereof as might be necessary, was to be applied to the improvement of the stream from Columbus to Walkers Bridge.

The existing project for the improvement of the Tombigbee River below Demopolis provides for the maintenance of the channel obtained under earlier appropriations. Snagging work under this project was resumed in August, 1902, the snag boat *Demopolis* being employed for this purpose. Operations were commenced at St. Nicholas Point and were carried upstream until December 15, 1902, when work was temporarily suspended owing to high water. On June 1, 1903, operations were resumed at Demopolis, Ala., by the snag boat *Tombigbee*, and progressed downstream until the end of the month.

A distance of 91 miles of channel above St. Nicholas Point was placed in a safe condition for navigation, as well as 16 miles below Demopolis.

### DEMOPOLIS TO COLUMBUS.

The last appropriation for the improvement of this section of the river was made by the river and harbor act of March 3, 1899. Operations have been carried on during the last fiscal year by the snagboat *Vienna* under the existing project, which provides for the maintenance of the channel of the river between Demopolis, Ala., and Columbus, Miss. Work was in progress between October 1 and December 13, 1902, and between May 25 and June 30, 1903. During this time the channel of the river was placed in a safe condition for navigation over a distance of 42½ miles above Demopolis, and for a distance of 18 miles from near Memphis to Pickensville, Ala.

### COLUMBUS TO WALKERS BRIDGE.

Under the project for the expenditure of available funds, an allotment of \$4,000 was made from the appropriation of 1902 for improving the Tombigbee River from Columbus to Walkers Bridge. The existing project for the improvement of the river within these limits provides for the maintenance of the channel obtained under earlier appropriations. Work in connection with this improvement was commenced June 1, 1903. This work was started at Aberdeen, Miss., and progressed upstream from that point. Up to the close of the fiscal year a distance of 16 miles of the river had been worked over.

During the coming fiscal year it is proposed to apply available funds to the prosecution of snagging operations on the Tombigbee River within the limits of these three projects.

Respectfully submitted.

DAVID G. ANDERSON,  
*Assistant Engineer.*

Capt. W. E. CRAIGHILL,  
*Corps of Engineers.*

## T 3.

OPERATING AND CARE OF LOCKS AND DAMS ON BLACK WARRIOR  
AND WARRIOR RIVERS, ALABAMA.

## (a) LOCKS 1, 2, AND 3, BLACK WARRIOR RIVER.

## GENERAL CONDITION OF LOCKS.

The locks and dams were completed and opened for traffic in November, 1895, and are in fair condition.

## WORK OF PAST YEAR.

The three locks were operated with little interruption during the year, one boat being delayed twenty-six hours at Lock 1 on March 24 and 25, owing to the gates being fouled by flood deposits. No other delay to traffic occurred.

At Lock 1, 293 cubic yards of deposit were removed from lock chamber and placed above the dam. At Lock 2, cracks in timber sheathing of dam were filled to reduce leakage. At Lock 3, about 1,425 cubic yards of flood deposit were removed from lock chamber and upper approach. The downstream face of dam and the rubble wall below abutment were repaired and iron gauges were completed.

Four wooden barges, 24 by 90 feet, and 5 feet deep, were built, at a cost of about \$8,200. A new 8-inch dredge pump was purchased, fitted up on an old barge, and used for cleaning out locks and approaches. Lumber was ordered for a new hull for this dredge.

*Statement of expenditures for operating and caring for Locks 1, 2, and 3, Black Warrior River, Alabama, during the fiscal year ending June 30, 1903, submitted in accordance with Circular No. 12, Office Chief of Engineers, dated July 31, 1897.*

Items.	Allotted.	Expended.	Balance.	Minus balance.
Salaries lockmaster and lockmen .....	\$4,140.00	\$3,696.67	\$443.33	.....
Extra labor .....	1,000.00		1,000.00	.....
Riprap bank protection .....	1,000.00	83.41	966.59	.....
Removing flood deposits from locks and approaches.....	5,000.00	2,717.58	2,282.42	.....
Filling above dams.....	1,000.00	133.06	866.94	.....
Needed to complete four barges .....	2,800.00	4,388.16		\$1,588.16
Painting gates and valves .....	500.00		500.00	.....
Repairing gate fastenings .....	200.00	151.62	48.38	.....
Fuel, lights, and oil .....	100.00	45.00	55.00	.....
Tools .....	100.00	284.20		184.20
Telephone service and maintenance .....	150.00	44.71	105.29	.....
Incidentals .....	1,000.00	856.17	143.83	.....
Outstanding liabilities .....	8,900.00	8,900.00		.....
Total .....	20,890.00	16,250.58	6,411.78	1,772.36

*Money statement.*

July 1, 1902, balance unexpended .....	\$4,835.13
Amount allotted during fiscal year .....	16,054.87
	20,890.00
June 30, 1903, amount expended during fiscal year .....	16,250.58
	4,639.42
July 1, 1903, balance unexpended .....	
July 1, 1903, outstanding liabilities .....	400.00
July 1, 1903, balance available .....	4,239.42

# 1254 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

## COMMERCIAL STATISTICS.

### Traffic.

Vessels, etc.	Lock No. 1.			Lock No. 2.			Lock No. 3.		
	Ascend- ing.	Descend- ing.	Total.	Ascend- ing.	Descend- ing.	Total.	Ascend- ing.	Descend- ing.	Total.
Towboats.....	109	107	216	278	277	555	282	282	564
Government boats.....	44	45	89	49	49	98	49	49	98
Coal barges.....	124	117	241	128	125	253	128	125	253
Other barges.....	13	11	24	20	18	38	136	125	261
Government barges.....	73	82	155	88	85	173	83	82	165
Government small craft.....	20	23	43	116	111	227	86	84	170
Small craft.....	19	16	35	21	18	39	25	31	56
Rafts.....	3	7	10	3	5	8	4	5	9
Total.....	406	408	813	703	688	1,391	798	783	1,576
Passengers.....	44	57	101	845	905	1,750	918	993	1,911
Lockages.....	213	221	434	464	467	931	439	462	901

### Commerce.

Lock and date.	Coal.	Steel rails.	Stone.	Sand.	Logs.	Lumber.	General and mis- cellane- ous.	Total.
<i>Lock No. 1.</i>	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>
July, 1902.....	20	2				63	100	185
August, 1902.....				231		150		381
September, 1902.....	35			25		21		81
October, 1902.....	319					79		398
November, 1902.....	590		726					1,316
December, 1902.....	454		730					1,184
January, 1903.....	490		1,133					1,623
February, 1903.....	360		1,595					1,955
March, 1903.....	495		2,256		533			3,284
April, 1903.....	465		3,137					3,602
May, 1903.....	352		3,025				4	3,381
June, 1903.....	280		494				2	776
Total.....	3,860	2	13,096	256	533	313	106	18,166
<i>Lock No. 2.</i>								
July, 1902.....	60						32	92
August, 1902.....				177		45	32	254
September, 1902.....	35			25			33	93
October, 1902.....	319					79	23	421
November, 1902.....	590		726			21	14	1,351
December, 1902.....	490		730				11	1,231
January, 1903.....	590		1,133				12	1,735
February, 1903.....	410		1,595				1	2,006
March, 1903.....	495		2,256		533		5	3,289
April, 1903.....	590		3,137			5	11	3,743
May, 1903.....	352		3,025				12	3,389
June, 1903.....	280		494			4	20	796
Total.....	4,211		13,096	202	533	154	206	18,402
<i>Lock No. 3.</i>								
July, 1902.....	60			492			33	585
August, 1902.....				525		45	36	606
September, 1902.....	35			416			33	484
October, 1902.....	319			181		79	23	602
November, 1902.....	590		726	137		21	14	1,488
December, 1902.....	490		730				11	1,231
January, 1903.....	590		1,133				12	1,735
February, 1903.....	410		1,595				3	2,008
March, 1903.....	495		2,256		590		9	3,350
April, 1903.....	590		3,137	82		5	11	3,825
May, 1903.....	352		3,025	52			12	3,441
June, 1903.....	280		494	116		4	21	915
Total.....	4,211		13,096	2,001	590	154	218	20,270

# APPENDIX T—REPORT OF CAPTAIN CRAIGHILL. 1255

Comparative table of commerce through locks.

LOCK NO. 1.

Items.	Fiscal year ending June 30—						
	1897.	1898.	1899.	1900.	1901.	1902.	1903.
<b>VESSELS.</b>							
Steamboats.....number..	67	233	172	71	94	59	305
Barges.....do.....	89	403	118	87	180	131	420
Steamboats.....tonnage..	(a)	6,165	3,665	1,892	3,135	3,621	18,345
Barges.....do.....	(a)	29,032	5,770	5,465	19,265	12,884	24,990
Passengers.....number..	58	203	348	36	28		101
Lockages.....do.....	228	537	220	119	199	118	434
<b>FREIGHT CARRIED.</b>							
Coal.....tons..	1,925	2,223	1,069	615	3,305	240	3,860
Corn.....do.....					12		
Cotton.....do.....				88			
Hay.....do.....					10		
Steel rails.....do.....				28			2
Cement.....do.....			88	22			
Stone.....do.....		5,076			2,082	3,938	13,096
Sand.....do.....		148			128	45	256
Oats.....do.....					18		
Cross-ties.....do.....		113					
Hewn timber.....do.....		5,264					
Logs.....do.....	149	4	342	138		87	538
Lumber.....do.....	81	352	182	596	1,701	525	813
General and miscellaneous.....do.....	14	111	90	219	293	255	106
<b>Total</b> .....	<b>2,169</b>	<b>13,291</b>	<b>1,761</b>	<b>1,656</b>	<b>7,549</b>	<b>5,090</b>	<b>18,166</b>

LOCK NO. 2.

<b>VESSELS.</b>							
Steamboats.....number..	294	633	297	104	371	263	653
Barges.....do.....	235	439	147	105	162	268	464
Steamboats.....tonnage..	(a)	13,965	6,431	2,657	9,111	8,708	27,007
Barges.....do.....	(a)	33,590	7,800	6,750	21,479	24,312	27,220
Passengers.....number..	1,342	2,994	721	71	1,275	494	1,750
Lockages.....do.....	584	774	354	208	506	455	981
<b>FREIGHT CARRIED.</b>							
Coal.....tons..	4,706	4,139	1,269	707	3,945	450	4,211
Corn.....do.....		25			12		
Cotton.....do.....				38			
Hay.....do.....					10		
Steel rails.....do.....		22		20			
Cement.....do.....		9	88	22			
Stone.....do.....		5,210			1,277	6,320	13,096
Sand.....do.....		148			68	45	202
Oats.....do.....					18		
Posts.....do.....		14					
Cross-ties.....do.....		113					
Hewn timber.....do.....		5,527					
Logs.....do.....	165	16	392	138		87	538
Lumber.....do.....	146	514	346	626	1,713	805	154
General and miscellaneous.....do.....	44	320	110	285	430	157	206
<b>Total</b> .....	<b>5,061</b>	<b>16,057</b>	<b>2,205</b>	<b>1,836</b>	<b>7,473</b>	<b>7,864</b>	<b>18,402</b>

LOCK NO. 3.

<b>VESSELS.</b>							
Steamboats.....number..	309	636	308	111	473	471	662
Barges.....do.....	211	474	151	110	271	543	679
Steamboats.....tonnage..	(a)	13,562	6,729	2,948	11,635	13,967	27,196
Barges.....do.....	(a)	35,790	8,060	7,020	28,430	38,942	85,950
Passengers.....number..	1,538	3,089	732	111	1,482	828	1,911
Lockages.....do.....	551	815	372	224	614	660	901
<b>FREIGHT CARRIED.</b>							
Coal.....tons..	4,699	4,618	1,456	757	4,255	625	4,211
Corn.....do.....		25			12		
Cotton.....do.....				38			

a No record kept.

## 1256 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

*Comparative table of commerce through locks—Continued.*

## LOCK NO. 3—Continued.

Items.	Fiscal year ending June 30—						
	1897.	1898.	1899.	1900.	1901.	1902.	1903.
FREIGHT CARRIED—continued.							
Hay.....tons.....					10		
Steel rails.....do.....		22		20			
Cement.....do.....		9	88	22			
Stone.....do.....		5,290			1,804	9,314	13,096
Sand.....do.....		148			845	1,819	2,001
Oats.....do.....					18		
Posts.....do.....		14					
Cross-ties.....do.....		113					
Hewn timber.....do.....		5,728					
Logs.....do.....	178	74	332	138		87	590
Lumber.....do.....	139	514	346	626	1,718	805	154
General and miscellaneous.....do.....	44	320	110	285	487	170	218
Total .....	5,060	16,875	2,332	1,886	9,149	12,820	20,270

## (b) LOCKS 5 AND 6, WARRIOR RIVER.

## GENERAL CONDITION OF LOCKS.

Contract work was completed and the locks turned over to the United States in December, 1902. Lock 5 has not been in operation, owing to failure to complete the erection of gates before the floods of the past winter set in, and because the timber floor of this lock was lifted by upthrust in November, 1902, and has not yet been repaired. Lock 6 has been in operation since October, 1902.

## WORK OF THE PAST SIX MONTHS.

The timber aprons below both dams were greatly injured by the action of heavy drift. Considerable slipping of the riprap bank protection and considerable erosion from the bed of the stream below the dams occurred during the winter, owing to the very soft character of the alluvial soil. Stone filling was placed on and below the dam aprons, also along the back of river walls and along the face of abutments, at both locks, in order to check erosion. Riprap bank protection was repaired and extended, and the berm back of Lock 6 was covered with quarry waste for protection from floods. Stone, to the amount of 11,111 tons, was quarried near Tuscaloosa, transported to these locks, and placed as above described; 7,709 tons at Lock 6 and 3,402 tons at Lock 5. Prior to January 1, 1903, 719 tons were placed at Lock 6 and 732 tons at Lock 5, making a total of 12,562 tons thus furnished and placed by the United States, with hired labor, after the contract work was completed.

One wooden barge, 24 by 90 feet, and 5 feet deep, was built at a cost of about \$1,885, and one composite wood and steel barge of the same dimensions was built at a cost of about \$3,558.

New cylinder timbers were placed in the towboat *John Mills* and her machinery overhauled. The derrick boat was repaired and equipped with a new derrick and double-drum hoisting engine. Six

new yawls were begun. The launch *Mamie* and various other plant was repaired, and lumber was ordered for a new quarter boat.

Preparations were made for pumping out Lock 5 and repairing floor, and the placing of heavy stone paving on dam apron at Lock 6 was begun.

*Statement of expenditures for operating and caring for Locks 4, 5, and 6, Warrior River, Alabama, during the fiscal year ending June 30, 1903, submitted in accordance with Circular No. 12, Office of the Chief of Engineers, dated July 31, 1897.*

Items.	Allotted.	Expended.	Balance.
Salaries of junior engineer and lockmen .....	\$1,890.00	\$1,556.34	\$333.66
Extra labor.....	500.00	244.85	255.15
Riprap bank protection .....	5,000.00	3,613.71	1,386.29
Removing flood deposits from locks and approaches .....	2,000.00	53.89	1,946.11
Repairs to lock floors.....	7,000.00	729.84	6,270.16
Pumping and balling for repairs.....	1,500.00	.....	1,500.00
Lights and oils .....	110.00	10.53	99.47
Tools and plant .....	5,000.00	4,200.59	799.41
Incidentals.....	1,000.00	1,000.00	.....
Placing stone below dams.....	20,000.00	16,037.00	3,963.00
Total .....	44,000.00	27,446.75	16,553.25

### *Money statement.*

Amount allotted during fiscal year.....	\$44,000.00
June 30, 1903, amount expended during fiscal year .....	27,446.75
July 1, 1903, balance unexpended .....	16,553.25
July 1, 1903, outstanding liabilities .....	8,200.00
July 1, 1903, balance available .....	8,353.25

### COMMERCIAL STATISTICS.

#### *Traffic.*

[For the six months ending June 30, 1903.]

Vessels, etc.	Lock No. 5.			Lock No. 6.		
	Ascend- ing.	Descend- ing.	Total.	Ascend- ing.	Descend- ing.	Total.
Passenger boats.....	2	2	4	2	2	4
Towboats .....	5	5	10	4	4	8
Government boats.....	8	3	6	31	31	62
Coal barges .....	.....	.....	.....	.....	.....	.....
Other barges .....	9	10	19	8	9	17
Government barges.....	12	11	23	57	59	116
Government small craft .....	2	2	4	11	11	22
Small craft.....	.....	.....	.....	.....	.....	.....
Rafts.....	.....	21	21	.....	3	3
Total.....	33	54	87	113	119	232
Passengers .....	.....	.....	.....	.....	.....	.....
Lockages.....	.....	.....	.....	33	33	66

All traffic at Lock 5 passed over dam—lock not in operation.

# 1258 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

## Commerce.

[In tons.]

Lock and date.	Coal.	Corn.	Oil.	Cotton.	Stone.	Logs.	General and miscellaneous.	Total.
<i>Lock No. 5.</i>	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>
January, 1903								
February, 1903	60	114	2	150	360	70	159	915
March, 1903		225			1,867	442	15	2,549
April, 1903					192	150		342
May, 1903						200		200
June, 1903								
Total	60	339	2	150	2,419	862	174	4,006
<i>Lock No. 6.</i>								
January, 1903	39				759			798
February, 1903	60	114	2		1,937		159	2,272
March, 1903		125			2,285			2,598
April, 1903					3,152			3,152
May, 1903	160				2,065	147		2,372
June, 1903	115				1,006		a 271	1,392
Total	374	239	2		11,182	147	{ 159 a 271 }	12,374

a Lumber.

## T 4.

### IMPROVEMENT OF PASCAGOULA RIVER AND HORN ISLAND HARBOR, MISSISSIPPI.

Accounts of this improvement are contained in the Annual Reports of the Chief of Engineers for 1900, page 2211, and 1902, page 1305.

The river and harbor act of June 13, 1902, modified the existing project for this improvement by increasing the depth to be obtained in the channel from 12 feet at mean low water to 17 feet at the same stage of tide.

A contract for the work of dredging in the Pascagoula River under the modified project with funds appropriated and authorized by the act of 1902, was entered into with Mr. George W. Catt, of New York, N. Y., under date of January 12, 1903. This contract provides for the formation of a narrow channel about 15 feet deep at low water within the limits of the project, the prices to be paid under this contract being 17 cents per cubic yard, place measurement, for work in the river section, and 15 cents per cubic yard, scow measurement, for work in the Mississippi Sound section.

Operations under this contract have not yet been commenced, but the contractor expects to place one machine on the work early in July, 1903.

Available funds will be applied during the coming fiscal year to the prosecution of dredging work under the existing contract.

Reference is had to the appended report of Mr. David G. Anderson, assistant engineer, on this improvement.

*Money statement.*

July 1, 1902, balance unexpended .....	\$38, 235. 64
Amount appropriated by sundry civil act approved March 3, 1903 .....	100, 000. 00
	<hr/>
June 30, 1903, amount expended during fiscal year .....	138, 235. 64
	5, 216. 95
	<hr/>
July 1, 1903, balance unexpended .....	133, 018. 69
July 1, 1903, balance available .....	133, 018. 69
	<hr/>
July 1, 1903, amount covered by uncompleted contracts.....	140, 000. 00
	<hr/>
{ Amount (estimated) required for completion of existing project .....	<sup>a</sup> 695, 622. 00
{ Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903.....	400, 000. 00
{ Submitted in compliance with requirements of sundry civil act of June 4, 1897.	

## APPROPRIATIONS.

By act of—		By act of—	
March 2, 1827 .....	\$8, 000	September 19, 1890 .....	<sup>b</sup> \$18, 000
May 23, 1828 .....	17, 500	July 13, 1892 .....	<sup>b</sup> 16, 200
August 30, 1852 .....	5, 000	August 18, 1894 .....	<sup>b</sup> 7, 600
June 17, 1878 .....	10, 000	June 3, 1896 .....	<sup>b</sup> 1, 200
March 3, 1879 .....	14, 000	March 3, 1899 .....	<sup>c</sup> 30, 000
June 14, 1880 .....	20, 000	June 6, 1900 .....	<sup>c</sup> 199, 600
August 5, 1886 .....	20, 000	June 13, 1902 .....	25, 000
August 5, 1886 (transferred from Horn Island Pass appropriation).....	5, 000	March 3, 1903 .....	100, 000
August 11, 1888.....	27, 000		
		Total .....	524, 100

## CONTRACT IN FORCE.

With George W. Catt, dated January 12, 1903, approved by the Chief of Engineers February 5, 1903, for dredging in Dog and Pascagoula rivers and Mississippi Sound, Mississippi, at the rate of 17 cents per cubic yard, measured in place, for material removed from section 1, and 15 cents per cubic yard, measured in scows, or 18½ cents measured in place, for material removed from section 2. Work to be commenced not later than October, 1903; continuing contract; to be completed by September 30, 1904.

## COMMERCIAL STATISTICS.

The following statement concerning the clearances from the port of Pascagoula for the calendar year ending December 31, 1902, was furnished by the United States custom-house at Pascagoula, Miss.:

Year.	Clearances.		Net tonnage.	Customs receipts.
	Foreign.	Domestic.		
1902 .....	200	61	131, 500	\$3, 927. 75

<sup>a</sup> Balance necessary to complete appropriations to amount of \$1,050,222, the estimated cost of Pascagoula River project..... \$657, 622  
Amount diverted from appropriation of June 6, 1900, for completing improvement of Horn Island Harbor..... 38, 000

695, 622

<sup>b</sup> Portions of Pascagoula River appropriations applied to dredging work.

<sup>c</sup> Excluding a total of \$88,000 applied to dredging in Horn Island anchorage.



## 1260 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

The following statement concerning the commerce of the Pascagoula River for the calendar year ending December 31, 1902, was furnished by the Pascagoula Commercial Club, of Scranton, Miss.:

Articles.	1902.	
	Tons.	Value.
ARRIVING.		
Logs and timber .....	400,000	\$1,200,000
Fish and oysters .....	1,200	42,000
Total .....	401,200	1,242,000
DEPARTING.		
Lumber and timber .....	250,000	2,000,000
Rosin .....	11,000	165,000
Turpentine .....	2,000	200,000
Charcoal .....	9,600	57,750
Total .....	272,600	2,422,750

REPORT OF MR. DAVID G. ANDERSON, ASSISTANT ENGINEER.

MOBILE, ALA., June 30, 1903.

CAPTAIN: I have the honor to submit the following report upon operations accomplished during the fiscal year ending June 30, 1903, in connection with the improvement of the Pascagoula River, Mississippi:

The river and harbor act of June 13, 1902, authorized the expenditure of a sum not to exceed \$150,000 on the work of continuing the improvement of the Pascagoula River, Mississippi, with a view to obtaining a 17-foot channel from 3 miles above the mouth of Dog River to the 17-foot contour in Mississippi Sound, the width of the channel to be 150 feet above the railroad bridge at Scranton and 300 feet below this point.

Work under the project for a 12-foot channel in this stream was completed in February, 1902, and the act of June 13, 1902, therefore modified the existing project by increasing the depth to be obtained from 12 feet to 17 feet.

A contract dated January 12, 1903, was entered into with Mr. George W. Catt for dredging the channel to the maximum depth which the available funds will permit. Operations under this contract have not been commenced, but the contractor expects to place the first machine on the work in July.

A recent examination of the 12-foot channel dredged under the last contract showed that this work had maintained itself quite well, except near the inner end of the channel of approach in Mississippi Sound and in the river just below the Louisville and Nashville bridge, at both of which places slight shoaling has occurred.

On June 30, 1903, the maximum low-water draft that could be carried through the dredged channel was 11 feet. The average range of the tide is  $1\frac{1}{2}$  feet.

Respectfully submitted.

DAVID G. ANDERSON,  
Assistant Engineer

Capt. W. E. CRAIGHILL,  
Corps of Engineers.

T 5.

### IMPROVEMENT OF PASCAGOULA, CHICKASAHAY, AND LEAF RIVERS, MISSISSIPPI.

The river and harbor act of June 13, 1902, combined the existing projects for the improvement of Pascagoula, Chickasahay, and Leaf rivers, Mississippi, for which appropriations had formerly been made separately, into one work of improvement. From the joint appropriation of \$8,500, carried by the act of 1902, for the improvement of these

three streams, \$4,000 was allotted to the improvement of Pascagoula River and \$2,250 each to its two tributaries, the Chickasahay and Leaf rivers.

(a) PASCAGOULA RIVER.

During the past year snagging operations were in progress on the Pascagoula River from October 1, 1902, to June 30, 1903, except during the high-water season of winter. During this time the entire river within the limits of the project was worked over and placed in condition for rafting and light-draft navigation.

It is proposed to hold the small balance of funds still available for the work of caring for public property.

*Money statement.*

July 1, 1902, balance unexpended .....	\$4,000.00
June 30, 1903, amount expended during fiscal year .....	3,160.88
July 1, 1903, balance unexpended .....	839.12
July 1, 1903, outstanding liabilities .....	425.00
July 1, 1903, balance available .....	414.12
<hr/>	
{ Amount that can be profitably expended in fiscal year ending June 30, 1905, for maintenance of improvement, in addition to the balance unexpended July 1, 1903 .....	
{ Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	
	5,000.00

(b) CHICKASAHAY RIVER.

No operations have been in progress during the past fiscal year, and expenditures were confined to the purchase of plant necessary for the prosecution of this improvement. It is proposed to commence snagging operations on this stream on July 1, 1903, and to apply the funds now available to this work.

*Money statement.*

July 1, 1902, balance unexpended .....	\$2,250.00
June 30, 1903, amount expended during fiscal year .....	257.35
July 1, 1903, balance unexpended .....	1,992.65
<hr/>	
{ Amount that can be profitably expended in fiscal year ending June 30, 1905, for maintenance of improvement, in addition to the balance unexpended July 1, 1903 .....	
{ Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	
	5,000.00

(c) LEAF RIVER.

On the Leaf River snagging work was in progress from September 8 to December 31, 1902, during which time the river from 30 miles above its mouth to the mouth of Bowie Creek, the upper limit of the project, a distance of about 45 miles, was placed in a good condition for rafting on a slight rise above low water.

## 1262 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

It is proposed to apply the small balance of available funds to the work of preserving and caring for public property.

Detailed information in regard to the improvement of Pascagoula, Chickasahay, and Leaf rivers, Mississippi, is contained in the appended report of Mr. David G. Anderson, assistant engineer.

*Money statement.*

July 1, 1902, balance unexpended .....	\$2, 250. 00
June 30, 1903, amount expended during fiscal year .....	1, 925. 65
July 1, 1903, balance unexpended .....	324. 35
<hr/>	
{ Amount that can be profitably expended in fiscal year ending June 30, 1905, for maintenance of improvement, in addition to the balance unexpended July 1, 1903. ....	
{ Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899. ....	
	5, 000. 00

## APPROPRIATIONS.

## For Pascagoula River:

## By act of—

March 3, 1881 .....	\$4, 000
August 2, 1882 .....	8, 000
July 5, 1884 .....	3, 000
September 19, 1890 .....	2, 000
July 13, 1892 .....	3, 800
August 18, 1894 .....	5, 400
June 3, 1896 .....	4, 800
June 13, 1902 (allotment) .....	4, 000
Total .....	35, 000

## For Chickasahay River:

## By act of—

September 19, 1890 .....	5, 000
July 13, 1892 .....	5, 000
August 18, 1894 .....	5, 000
June 3, 1896 .....	2, 000
March 3, 1899 .....	2, 500
June 13, 1902 (allotment) .....	2, 250
Total .....	21, 750

## For Leaf River:

## By act of—

September 19, 1890 .....	5, 000
July 13, 1892 .....	5, 000
August 18, 1894 .....	2, 500
June 3, 1896 .....	2, 500
March 3, 1899 .....	2, 500
June 13, 1902 (allotment) .....	2, 250
Total .....	19, 750

## COMMERCIAL STATISTICS.

The following statement concerning the commerce of the Pascagoula River and its tributaries, the Chickasahay and Leaf rivers, Mississippi, for the calendar year ending

<sup>a</sup> Portions of Pascagoula River appropriations applied to snagging work.

APPENDIX T—REPORT OF CAPTAIN CRAIGHILL. 1263

December 31, 1902, was furnished by the Pascagoula Commercial Club, of Scranton, Miss.:

Articles.	1902.	
	Tons.	Value.
PASCAGOULA RIVER.		
Logs, lumber, piling, etc.....	110,300	\$330,900
Turpentine.....	1,500	150,000
Rosin.....	5,000	75,000
Charcoal.....	1,250	7,500
General merchandise.....	2,500	250,000
Total.....	120,550	813,400
CHICKASAHAY RIVER.		
Logs and timber.....	66,000	231,000
Turpentine.....	150	15,000
Rosin.....	600	9,000
General merchandise.....	250	50,000
Total.....	67,000	305,000
LEAF RIVER.		
Logs and timber.....	206,700	617,100
Turpentine.....	50	5,000
Rosin.....	200	3,000
General merchandise.....	50	10,000
Total.....	206,000	635,100

NOTE.—The tonnages of Chickasahay and Leaf rivers passed down the Pascagoula River, but in the above statements the business originating on each stream is included alone.

REPORT OF MR. DAVID G. ANDERSON, ASSISTANT ENGINEER.

MOBILE, ALA., June 30, 1903.

CAPTAIN: I have the honor to submit the following report upon operations during the fiscal year ending June 30, 1903, in improving the Pascagoula River and its tributaries, the Chickasahay and Leaf rivers, Mississippi.

The river and harbor act of June 13, 1902, combined in one project the maintenance of the channels of Pascagoula, Chickasahay, and Leaf Rivers, Mississippi, appropriating \$8,500 for the purpose.

The projects for the improvement of these three streams were completed some years ago, and recent appropriations have been applied to maintenance, by the removal of obstructions from the channels and banks. The project for the expenditure of available funds, submitted July 5, 1902, provided for removing obstructions from the channels and banks of these streams by the use of the United States plant and hired labor. It was recommended in this project that the appropriation be allotted between the three streams, as follows:

Pascagoula River.....	\$4,000
Chickasahay River.....	2,250
Leaf River.....	2,250
Total.....	8,500

This allotment of the appropriation was approved by the Secretary of War under date of July 30, 1902, and preparations were immediately commenced toward equipping the necessary working parties. The results accomplished on these streams up to the present time are as follows:

PASCAGOULA RIVER.

Snagging was commenced on October 1, 1902, at Moss Point, Mississippi, the party working upstream. The lower portions of the stream were found to be in fair condition, the heaviest work being encountered in the upper reaches. Operations were continued until December 20, 1902, when high water compelled the suspension of work for the winter. At this time a distance of 78½ miles of river had been worked

## 1264 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

over and placed in fair condition for light-draft boats. On June 1, 1903, work was resumed. The lower reaches of the river were worked over again where necessary, as the party proceeded upstream to the point at which operations were suspended in 1902, and the work of improvement was then carried on from the latter point to the junction of the Chickasahay and Leaf rivers, the upper limit of the Pascagoula River project. The latter point was reached on June 30, 1903, after about 100 miles of river had been worked over.

Operations during the past fiscal year have resulted in restoring the clear low-water channel in Pascagoula River from Moss Point to the junction of the Chickasahay and Leaf rivers, Mississippi. This stream is used to a great extent for rafting logs and timber, and on this account the channel is very frequently obstructed by sunken logs and deadheads. Owing to the lack of a snag boat for use on this improvement during the past year it has been impossible to place the lower reaches of this stream, which are used by towboats, in as safe a condition as is considered desirable.

It is proposed to apply the small balance of funds remaining from the appropriation of 1902 to the work of caring for United States plant.

### CHICKASAHAY RIVER.

Expenditures during the past year have been applied to the purchase of working plant which will be necessary for the prosecution of this improvement. It is proposed to begin active snagging operations on this stream on July 1, 1903, and for this purpose the working party which completed operations on the Pascagoula River on June 30, 1903, will be utilized. This work will be commenced at the mouth of the river and will be carried on upstream toward Eucatunna, the upper limit of the project. It is proposed to apply available funds to the accomplishment of as much of this work of improvement as may be possible.

### LEAF RIVER.

The working party for the prosecution of this improvement was organized in August, 1902, and active operations were commenced in September, 1902, at Beaumont, Miss., about 30 miles above the mouth of the stream. Operations were carried on upstream to the mouth of Bowie Creek, the upper limit of the project, a distance of about 45 miles.

Work was suspended on December 31, 1902, owing to the exhaustion of available funds.

A clear low-water channel has been obtained within the limits over which the operations of 1902 extended, and permitted the commencement of rafting during the past winter at a lower stage than ever before. The river between the mouth and a point in the vicinity of Beaumont was improved during 1899 and 1900, so that the channel of this stream, within the limits of the project, is now in fair condition, except in some of the lower reaches where obstructions have lodged in the stream since the completion of work in this locality in 1900.

It is proposed to apply the small balance of funds now available to the work of caring for United States plant.

Respectfully submitted.

DAVID G. ANDERSON,  
*Assistant Engineer.*

Capt. W. E. CRAIGHILL,  
*Corps of Engineers.*

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## T 6.

### IMPROVEMENT OF HARBOR AT BILOXI, MISSISSIPPI.

An account of work performed at this locality is contained in the Annual Report of the Chief of Engineers for 1894, page 1325.

With the funds appropriated in the river and harbor act of June 13, 1902, a complete survey of Biloxi Harbor was undertaken in October, 1902. This survey showed that during the ten years which have elapsed since the last dredging the entrance channel leading to the wharves at Biloxi has shoaled over its entire length. The work of redredging this channel was advertised under date of March 10, 1903, and a contract for the execution of this work was entered into on May 21, 1903, with Mr.

Rittenhouse Moore, of Mobile, Ala., at the rate of 22 cents per cubic yard, place measurement. Up to the close of the fiscal year operations of dredging had not yet been commenced.

It is proposed to apply available funds to the prosecution of dredging work under the existing project.

The detailed report of Mr. David G. Anderson, assistant engineer, is appended.

*Money statement.*

July 1, 1902, balance unexpended.....	\$10,000.00
June 30, 1903, amount expended during fiscal year .....	575.30
July 1, 1903, balance unexpended .....	9,424.70
July 1, 1903, amount covered by uncompleted contracts.....	8,195.00
<hr/>	
{ Amount that can be profitably expended in fiscal year ending June 30, 1905, for maintenance of improvement, in addition to the balance unexpended July 1, 1903. ....	
{ Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899. ....	
	15,000.00

APPROPRIATIONS.

By act of—		By act of—	
August 2, 1882 .....	\$5,000	June 13, 1902.....	\$10,000
August 5, 1886 .....	12,500		
August 11, 1888 .....	18,500	Total .....	55,000
September 19, 1890.....	9,000		

CONTRACT IN FORCE.

With Rittenhouse Moore, dated May 21, 1903, approved by the Chief of Engineers June 19, 1903, for dredging in harbor at Biloxi, Miss., at the rate of 22 cents per cubic yard, measured in place, for material removed. Work to be commenced before December 31, 1903; to be completed by April 30, 1904.

COMMERCIAL STATISTICS FOR THE CALENDAR YEAR ENDING DECEMBER 31, 1902.

	1902.	
	Tons.	Value.
<b>IMPORTS.</b>		
Oysters, fish, shrimp, etc.....	17,000	\$510,000
Lumber, brick, and building material.....	2,600	23,400
General merchandise.....	6,500	325,000
Total.....	26,100	858,400
<b>EXPORTS.</b>		
Turpentine and rosin.....	6,600	330,000
Oysters, fish, shrimp, etc.....	5,000	155,000
Merchandise.....	8,000	48,000
Lumber.....	(b)	(b)
Total.....	19,600	533,000

<sup>a</sup> Erroneously reported last year as \$10,617.73.

<sup>b</sup> Accurate figures as to the amount and value of the lumber shipped from Biloxi could not be obtained.

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REPORT OF MR. DAVID G. ANDERSON, ASSISTANT ENGINEER.

MOBILE, ALA., June 30, 1903.

CAPTAIN: I have the honor to submit the following report of operations accomplished in connection with the improvement of the harbor at Biloxi, Miss., during the fiscal year ending June 30, 1903:

The river and harbor act of June 13, 1902, carried an appropriation of \$10,000 for Biloxi Harbor, Mississippi, to be applied to the work of continuing the improvement. The existing project for this improvement, which was adopted in 1862 and modified in 1884, provides for obtaining a channel of entrance 8 feet deep at mean low water, 150 feet wide, and with a length of about 1 mile, from Mississippi Sound to the wharves at Biloxi, Miss.

The project approved on August 14, 1902, provided for the application of the available balance, after completing a survey of the channel, to the work of redredging the channel to as great a width and depth as might be possible, not exceeding the dimensions of the project.

The survey of the channel was commenced shortly after October 1, 1902, and was completed by the middle of the same month, at a cost of \$525. The survey showed that during the nine years which had elapsed since the suspension of dredging operations, the channel had shoaled up throughout its entire length to an extent of from 1 to 2 feet, the minimum low-water depth remaining within the limits of the improved channel being 6.3 feet.

In March and April, 1902, an investigation of the planes of mean low water in use in this district was made. This investigation was based on the result of observations as to the elevation of mean Gulf level at Biloxi, Miss., made by the Mississippi River Commission, and showed that the planes of reference in use on the Mississippi Sound works were generally too high. None of the bench marks in use at this locality during the period of early improvements could be found, but from observations of old tide-gauge marks, the lowering of the low-water plane in 1902 was estimated to be about 0.6 foot.

A contract, dated May 21, 1903, was entered into with Mr. Rittenhouse Moore for dredging at 22 cents per cubic yard, place measurement, but at the close of the fiscal year operations by the contractor had not been begun.

The funds available will permit of the formation of a narrow channel 8 feet deep from Mississippi Sound to the anchorage and wharves at Biloxi, Miss.

On June 30, 1903, the maximum low-water draft that could be carried into Biloxi was 6½ feet, the average range of the tide being about 1½ feet.

Respectfully submitted.

DAVID G. ANDERSON,  
*Assistant Engineer.*

Capt. W. E. CRAIGHILL,  
*Corps of Engineers.*

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T 7.

### CHANNEL FROM GULFPORT TO SHIP ISLAND HARBOR, MISSISSIPPI.

Dredging at this locality, under the existing contract with Mr. Spencer S. Bullis, of Gulfport, Miss., was commenced April 16, 1901, and has been prosecuted continuously since that date. This contract calls for the completion of a channel 300 feet wide between Ship Island Harbor and Gulfport, Miss., with an anchorage basin at its shore end 2,640 by 1,320 feet in area, both with a depth of 19 feet at low water.

The work of dredging the channel to its projected dimensions was completed during the past year, but the contractor immediately commenced deepening the central portions of the cut in order to insure a sufficient depth therein at the time of the final examination. Operations on the anchorage basin have progressed slowly, and so far only a portion of the eastern half of this work has been completed.

The time limit on this contract, which expired on April 16, 1903,

was extended for a reasonable time by authority of the Chief of Engineers, on condition that the contractor should pay the additional cost of inspection necessitated by the extension.

It is proposed to hold the available funds until the completion of both the channel and anchorage basin to their projected dimensions.

Detailed report of Mr. David G. Anderson, assistant engineer, on this improvement is appended.

*Statement of expenditures for examinations and inspections of work of dredging a channel and anchorage basin between Ship Island Harbor and Gulfport, Miss., during the fiscal year ending June 30, 1903, submitted in accordance with Circular No. 12, Office of the Chief of Engineers, dated July 31, 1897.*

Item.	Allotted.	Expended.	Balance.
Inspection and superintendence .....	\$6,912.77	\$4,649.83	\$2,262.94
Examinations and surveys .....	3,600.00	79.27	3,520.73
Office expenses .....	500.00	480.00	20.00
Mileage .....	150.00	49.90	100.10
Total .....	11,162.77	5,259.00	5,903.77

#### *Money statement.*

July 1, 1902, balance unexpended .....	\$154,962.77
June 30, 1903, amount allotted during fiscal year .....	6,200.00
	161,162.77
June 30, 1903, amount expended during fiscal year .....	5,259.00
July 1, 1903, balance unexpended .....	155,903.77
July 1, 1903, outstanding liabilities .....	300.77
July 1, 1903, balance available .....	155,603.00
July 1, 1903, amount covered by uncompleted contracts .....	150,000.00

#### APPROPRIATIONS.

By act of—	
July 5, 1884 (allotments) .....	\$16,685.04
June 28, 1902 .....	150,000.00
Total .....	166,685.04

#### CONTRACT IN FORCE.

With Spencer S. Bullis, dated February 20, 1901, approved by the Chief of Engineers March 18, 1901, for dredging a channel and anchorage basin in Mississippi Sound, between Ship Island Harbor and Gulfport, Miss., for \$150,000, and for maintaining said channel and anchorage basin for a period of five years after its completion, for the sum of \$10,000 annually. Work commenced April 16, 1901; was to be completed by April 16, 1903, but time of completion has been extended for such period as is deemed reasonable by the district engineer officer. Maintenance to commence immediately upon completion of the channel and basin.



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## COMMERCIAL STATISTICS FOR THE CALENDAR YEAR ENDING DECEMBER 31, 1902.

Articles.	1902.	
	Tons.	Value.
<b>ARRIVING.</b>		
Steel rails .....	3, 172	\$95, 160
Cement .....	620	8, 000
Total .....	3, 792	103, 160
<b>DEPARTING.</b>		
Lumber and timber .....	24, 450	203, 750

During the year ending December 31, 1902, 25 vessels loaded their cargoes directly from the pier in the anchorage basin at Gulfport.

## REPORT OF MR. DAVID G. ANDERSON, ASSISTANT ENGINEER.

MOBILE, ALA., June 30, 1903.

CAPTAIN: I have the honor to submit the following report of operations accomplished during the fiscal year ending June 30, 1903, on the work of "Improving channel from Gulfport to Ship Island Harbor, Mississippi."

The work of dredging at this locality under the existing contract with Mr. Spencer S. Bullis, which provides for the formation of a channel 300 feet wide from Ship Island Harbor to Gulfport, and an anchorage basin next the shore 1,320 feet by 2,640 feet, both with a depth of 19 feet at low water, was commenced on April 18, 1901, and has been prosecuted continuously since that date. According to the terms of this contract, no payment is to be made the contractor until the completion of the channel and basin to their projected dimensions.

The work of dredging during the past fiscal year has resulted in enlarging the 19-foot channel from a width of 160 feet to its full width of 300 feet. Upon the completion of the formation of this channel, the contractor commenced the work of dredging six cuts in the center of the channel, aggregating 240 feet in width, in order to insure a sufficient depth therein at the time of the examination of the channel for acceptance. In the anchorage basin a hydraulic dredge has continued operations in the eastern part of the anchorage area, extending and dredging the cuts which had been made prior to July 1, 1902. The depths in these cuts range at present from 15 to 22 feet. No work has been accomplished yet toward the formation of the western half of the basin.

During the past fiscal year the dumping of 4,675 scow loads of material, dredged from the Gulfport channel under the existing contract, has been supervised by inspectors appointed by this office.

On June 30, 1903, the channel between Gulfport and Ship Island Harbor was available at low water for vessels of 20½ feet draft, the depths ranging from 21 to 25 feet, except over one small 19-foot lump, which is now in process of removal.

It is expected that the Gulfport channel will be completed to its projected dimensions during August, 1903, but a considerable amount of work remains to be accomplished on the anchorage basin, and, under the terms of the contract, the channel itself can not be accepted until the completion of the latter work. In order to hasten work on the anchorage basin the contractor is completing the construction of a new hydraulic dredge with a 20-inch discharge. A revetment is in process of construction on the north, west, and southwest sides of the basin, and upon the completion of this revetment, the material from the western half of the anchorage site will be pumped behind it.

The time limit of the dredging work at Gulfport expired on April 16, 1903. By authority of the Chief of Engineers, this limit was extended for a reasonable length of time upon the condition that the resultant cost of inspection was to be paid by the contractor.

It is proposed during the coming fiscal year to continue the supervision of the contractor's operations and the dumping of dredged material at Gulfport, and upon the completion of work in the anchorage basin to make a detailed survey of the

results accomplished under the contract, with a view to making payment for this work should the channel and anchorage basin be in the condition required by the specifications.

Respectfully submitted.

Capt. W. E. CRAIGHILL,  
*Corps of Engineers.*

DAVID G. ANDERSON,  
*Assistant Engineer.*

T 8.

IMPROVEMENT OF PEARL RIVER BELOW ROCKPORT, MISSISSIPPI.

During the past fiscal year available funds have been applied to the construction of working plant and to snagging operations. Owing to the fact that the snag boat formerly used on this improvement was in a worn-out condition, the construction of a new boat became necessary. This work was completed under written agreement during the past winter, the total cost of the boat being about \$3,250.

Snagging operations were commenced with the new snag boat *Pearl* on June 1, 1903, and are still in progress. Up to June 30 obstructions had been removed from 15½ miles of river in the vicinity of the lower end of Holmes Bayou, and this portion of the river was placed in good condition for rafting or steamboat navigation on a slight rise above low water.

It is proposed to continue snagging operations during the coming fiscal year with funds still available, and to place the lower end of the river, through and above Holmes Bayou in a safe condition for navigation.

Report in detail by Mr. David G. Anderson, assistant engineer, is appended.

*Money statement.*

July 1, 1902, balance unexpended .....	\$7,000.00
June 30, 1903, amount expended during fiscal year .....	3,488.82
July 1, 1903, balance unexpended .....	3,511.18
July 1, 1903, outstanding liabilities .....	474.00
July 1, 1903, balance available .....	3,037.18
{ Amount (estimated) required for completion of existing project .....	33,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903:	
For works of improvement .....	\$10,000.00
For maintenance of improvement .....	7,000.00
	17,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

APPROPRIATIONS.

By act of—		By act of—	
June 14, 1880 .....	\$30,000	July 13, 1892 .....	\$15,000
March 3, 1881 .....	25,000	August 18, 1894 .....	5,000
August 2, 1882 .....	15,000	June 3, 1896 .....	10,000
July 5, 1884 .....	10,000	March 3, 1899 .....	7,000
August 5, 1886 .....	13,125	June 13, 1902 .....	7,000
August 11, 1888 .....	10,000		
September 19, 1890 .....	15,000	Total .....	182,125

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COMMERCIAL STATISTICS FOR THE CALENDAR YEAR ENDING DECEMBER 31, 1902.

Articles.	Tons.	Value.
Pine and cypress logs.....	200,000	\$450,000
Cotton, naval stores, etc.....	2,000	100,000
Total.....	202,000	550,000

In addition to the above, manufactured lumber to the value of about \$600,000 passes over the portions of the stream not included in the present project of improvement.

## REPORT OF MR. DAVID G. ANDERSON, ASSISTANT ENGINEER.

MOBILE, ALA., June 30, 1903.

CAPTAIN: I have the honor to submit the following report of operations accomplished during the fiscal year ending June 30, 1903, in connection with the improvement of Pearl River below Rockport, Miss.:

The river and harbor act of June 13, 1902, appropriated the sum of \$7,000 for the work of maintaining the improvement heretofore accomplished on Pearl River below Rockport. A project for the expenditure of this appropriation, approved August 9, 1902, provided for the application of available funds to the work of constructing plant for the prosecution of the improvement, and to the work of removing obstructions from the channel of the stream. Between September, 1902, and February, 1903, a new snag boat was constructed under written agreement at a total cost of about \$3,250.

Snagging operations commenced June 1, 1903, on West Pearl River, about 18 miles above its mouth, and advanced upstream. About 15½ miles of river have been worked over.

On June 30, 1903, the channel of Pearl River below Rockport was badly obstructed by snags, logs, and overhanging trees, particularly over the section known as Holmes Bayou, which locality proved impassable last spring for steamboats and almost impassable for rafts and logs. No work has been done through Holmes Bayou for some years, owing to the fact that heretofore appropriations have been limited to the improvement of the stream above that point.

During the coming fiscal year it is proposed to apply available funds to the work of removing obstructions from the channel and banks of the stream within the limits of the project as far as may be possible.

Respectfully submitted.

DAVID G. ANDERSON,  
Assistant Engineer.

Capt. W. E. CRAIGHILL, Corps of Engineers.

T 9.

## IMPROVEMENT OF PEARL RIVER BETWEEN EDINBURG AND JACKSON, MISSISSIPPI.

The river and harbor act of June 13, 1902, made a single appropriation for the two upper sections of the Pearl River, one from Carthage to Jackson and the other from Edinburg to Carthage, thus combining into one work the projects for the improvement of these two sections of this stream.

The existing project for this improvement contemplates the maintenance of the improved channel between Edinburg and Jackson obtained under earlier appropriations. In conformity with this proj-

ect available funds have been applied during the past fiscal year to the work of removing obstructions which have been carried into the river channel during the high stages of the stream. Snagging operations were commenced at Edinburg on September 9, 1902, and were carried downstream past Carthage to a point about 43 miles below the latter town. Work was suspended at this locality on December 31, 1902, owing to high water.

It is proposed to resume snagging work on this section of the river early in the coming fiscal year and to remove the worst obstructions from the channel over the remainder of the distance to Jackson, the lower limit of this improvement.

No commercial statistics could be obtained on this improvement.

Report giving details by Mr. David G. Anderson, assistant engineer, is appended.

*Money statement.*

July 1, 1902, balance unexpended .....	\$3,000.00
June 30, 1903, amount expended during fiscal year .....	1,950.71
July 1, 1903, balance unexpended .....	1,049.29
<hr/>	
{ Amount that can be profitably expended in fiscal year ending June 30, 1905, for maintenance of improvement, in addition to the balance unexpended July 1, 1903 .....	7,000.00
{ Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7, of the river and harbor act of 1899.	

APPROPRIATIONS.

*Carthage to Jackson.*

By act of—		By act of—	
March 3, 1879 .....	\$6,000	July 13, 1892 .....	\$5,000
June 14, 1880 .....	7,500	August 18, 1894 .....	2,400
March 3, 1881 .....	2,500	June 3, 1896 .....	2,400
August 2, 1882 .....	2,500	March 3, 1899 .....	2,500
August 6, 1886 .....	2,250	June 13, 1902 .....	<sup>a</sup> 3,000
August 11, 1888 .....	2,500	Total .....	41,550
September 19, 1890 .....	3,000		

*Edinburg to Carthage.*

By act of—		By act of—	
July 5, 1884 .....	\$2,500	August 18, 1894 (maintenance) ..	\$500
August 5, 1886 .....	2,250	June 3, 1896 (maintenance) ..	500
August 11, 1888 .....	5,000	March 3, 1899 (maintenance) ..	1,000
September 19, 1890 .....	5,000	Total .....	17,250
July 13, 1892 (maintenance) ..	500		

REPORT OF MR. DAVID G. ANDERSON, ASSISTANT ENGINEER.

MOBILE, ALA., June 30, 1903.

CAPTAIN: I have the honor to submit the following report upon operations accomplished during the fiscal year ending June 30, 1903, in connection with the improvement of the Pearl River between Edinburg and Jackson, Miss.:

The river and harbor act approved June 13, 1902, carried an appropriation of \$3,000 for the improvement of Pearl River between Edinburg and Jackson. The existing project for the improvement of that portion of Pearl River between Carthage and

<sup>a</sup> For expenditure between Edinburg and Jackson.

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Jackson provides for obtaining a channel 2 feet deep at low water by the removal of snags, logs, and other obstructions from the stream, and the cutting of overhanging trees on the banks, while the project for the improvement of the stream between Edinburg and Carthage provides for the formation of a clear low-water channel by the removal of similar obstructions.

Previous operations of improvement on these sections of Pearl River were suspended in 1899, owing to the exhaustion of available funds. Subsequent to this time the channel of the stream within the limits of the projects had become more or less obstructed by logs, snags, and fallen trees, which accumulate in the channel after periods of high water. During the month of August, 1902, a working party was organized for the prosecution of snagging work. Work was commenced on September 8, 1902, at Edinburg, Miss., and was carried on downstream until December 31, 1902, when it was suspended for the winter. Up to this date the river channel had been restored to its improved condition for a distance of 68 miles below Edinburg.

With the available balance, amounting to about \$1,000, it is proposed to continue snagging work on the river below the point at which operations were suspended in 1902 and to carry the improvement to Jackson, if possible, by the removal of the worst obstructions over the remaining distance.

On June 30, 1903, the river was in good condition as far as operations were carried in 1902, but in the 60 miles of the river above Jackson the channel is still considerably obstructed by snags and fallen trees. The improvement is not permanent.

Respectfully submitted.

DAVID G. ANDERSON,  
*Assistant Engineer.*

Capt. W. E. CRAIGHILL,  
*Corps of Engineers.*

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### T 10.

#### REMOVING SUNKEN VESSELS OR CRAFT OBSTRUCTING OR ENDANGERING NAVIGATION.

During September, 1902, under an allotment of \$800 from the indefinite appropriation for "Removing sunken vessels or craft obstructing or endangering navigation," the wreck of the steamer *Baltimore* was removed from the channel of the Warrior River. This work was performed by United States plant and hired labor, at a total cost of \$530.19. The balance of the allotment and the sum of \$133.50, which was received from the sale of the machinery and iron recovered from the wreck, were subsequently deposited in the Treasury to the credit of the indefinite wreck appropriation.

In May, 1903, several sunken pontoons, which were proving a menace to navigation, were removed from the channel of Mobile River by the snag boat *Tombigbee*, the cost of this work being originally charged to the Mobile Harbor appropriation. On May 25, 1903, an allotment of \$118.25, the actual cost of the work of removal, was made from the appropriation for the removal of sunken vessels, etc., to reimburse the Mobile Harbor appropriation, and a similar sum which was received from the owners of the recovered property was deposited in the Treasury to the credit of the wreck appropriation.

Detailed report of Mr. David G. Anderson, assistant engineer, on work accomplished is appended.

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REPORT OF MR. DAVID G. ANDERSON, ASSISTANT ENGINEER.

MOBILE, ALA., June 30, 1903.

CAPTAIN: I have the honor to submit the following report upon the work accomplished in this district during the fiscal year ending June 30, 1903, in removing sunken vessels and other craft obstructing or endangering navigation:

In August, 1902, an allotment of \$800 was made for the removal of the wreck of

the steamer *Baltimore*, sunk in the channel of the Warrior River, about 5 miles above its mouth.

No reasonable bid having been received, the work of removing the *Baltimore* was commenced on September 10, 1902, by the U. S. snag boat *Vienna*. The hull of the wreck was broken up sufficiently to permit of the recovery of much of its machinery, after which the wreck was thoroughly shattered with dynamite, so as to facilitate the removal of the heavy timbers and the loosening of the portions of the hull embedded in the river bottom. The operations of removal were completed on September 24, 1902, the total cost of the work, including pay rolls, subsistence, towage, and incidental expenses, being \$530.19.

Under authority of the Department the boiler, shaft, machinery, and scrap iron recovered from the wreck of the *Baltimore* were disposed of to the Black Warrior Lumber Company, the only bidders, for the sum of \$133.50, and this amount, in addition to the unexpended balance, was deposited in the United States Treasury.

On April 6, 1903, the Mobile Harbor pilots made complaint of the existence of an obstruction in the dredged channel of Mobile River opposite the city. The snag boat *Tombigbee* was assigned to the work of raising the wreckage, which was found to be composed of several pontoons belonging to the Atlantic, Gulf and Pacific Company. The owners of the recovered property, upon being notified of the fact, reimbursed the United States to the amount of \$118.25, the actual cost of the work of removal.

Respectfully submitted.

DAVID G. ANDERSON,  
*Assistant Engineer.*

Capt. W. E. CRAIGHILL,  
*Corps of Engineers.*



## APPENDIX U.

IMPROVEMENT OF PASSES OF MISSISSIPPI RIVER, OF BAYOU  
LAFOURCHE, BAYOU PLAQUEMINE, GRAND RIVER AND PIGEON  
BAYOUS, AND OF BAYOUS COURTABLEAU AND TECHE, LOUISIANA.

REPORT OF LIEUT. COL. H. M. ADAMS, CORPS OF ENGINEERS, OFFICER  
IN CHARGE, FOR THE FISCAL YEAR ENDING JUNE 30, 1903, WITH  
OTHER DOCUMENTS RELATING TO THE WORKS.

### IMPROVEMENTS.

- |  |   |
|--|---|
| 1. Closing crevasse in Pass a Loutre, Mis-<br>sissippi River.    | 5. Maintenance of South Pass channel,<br>Mississippi River.       |
| 2. Outlet of Mississippi River.                                  | 6. Bayou Lafourche, Louisiana.                                    |
| 3. Southwest Pass of the Mississippi<br>River.                   | 7. Bayou Plaquemine, Grand River and<br>Pigeon bayous, Louisiana. |
| 4. Examinations and surveys at South<br>Pass, Mississippi River. | 8. Bayou Courtableau, Louisiana.                                  |
|  | 9. Bayou Teche, Louisiana.  |

UNITED STATES ENGINEER OFFICE,  
*New Orleans, La., July 11, 1903.*

GENERAL: I have the honor to submit herewith annual reports upon  
works of river and harbor improvement for this district for the fiscal  
year ended June 30, 1903, as follows:

\* \* \* \* \*

Very respectfully, your obedient servant,

H. M. ADAMS,  
*Lieut. Col., Corps of Engineers.*

Brig. Gen. G. L. GILLESPIE,  
*Chief of Engineers, U. S. A.*

### U 1.

#### CLOSING CREVASSE IN PASS A LOUTRE, MISSISSIPPI RIVER.

For details of the progress and completion of this work, see page  
1487, Annual Report of the Chief of Engineers for 1898, and page 1839  
of report for 1899.

During the past fiscal year there has been but little change in the con-  
dition of the dam which was built to close Pass a Loutre crevasse.  
The condition of the dam at the end of the year was as follows: From



## 1276 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

range No. 2, the extreme east end of the dam (see chart accompanying), to 18 feet from the same point, the dam has gone out; from 18 feet to 738 feet, the dam is in good condition; from 738 feet to 885 feet, the work is effective, although badly out of line and weak; from 885 feet to 1,819½ feet, all the work is gone; from 1,819½ feet to "Y" and from "Y" to "D" the work is in good condition.

The sediment has filled the bay below the dam to such an extent that the water is confined to small channels which are from 3 to 5 miles in length. This has decreased the velocity of the current through the opening in the dam so much that the channel at that place has shoaled about 20 feet during the year.

A survey of Pass a Loutre crevasse and vicinity was made in May, 1903, a chart showing the results of which is forwarded herewith.

### *Money statement.*

July 1, 1902, balance unexpended .....	\$21,004.92
July 1, 1903, balance unexpended and available .....	21,004.92

### ABSTRACT OF APPROPRIATIONS.

By act of Congress approved February 26, 1897 .....	\$250,000.00
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## U 2.

### IMPROVEMENT OF THE OUTLET OF THE MISSISSIPPI RIVER.

A history of the progress of the work will be found in Annual Report of the Chief of Engineers for 1901, page 1878; see also, Annual Report for 1902, page 1323.

During the past fiscal year no work has been done under the direction of the New Orleans, La., office. The expenses during the year were for traveling expenses and payment for telegraphic service.

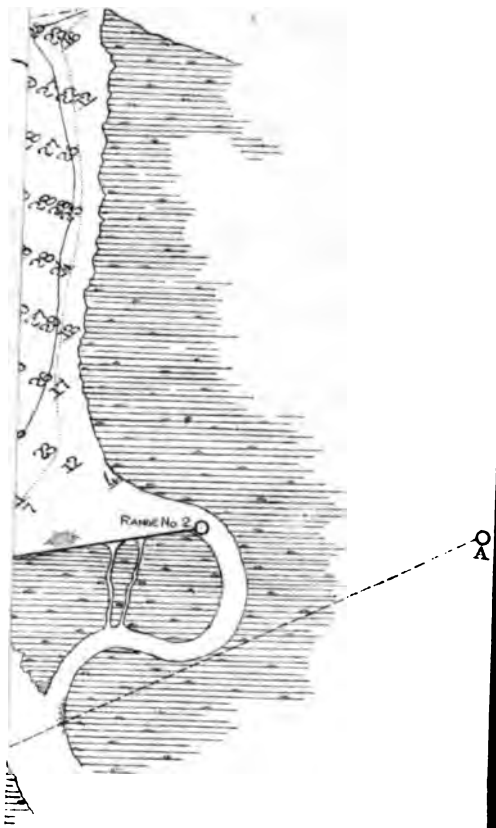
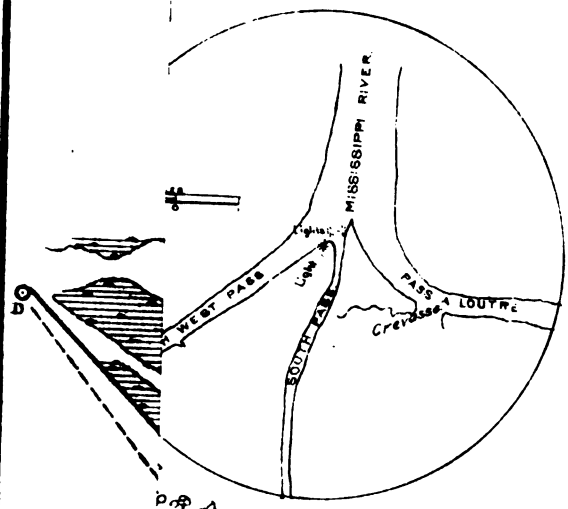
### *Money statement.*

July 1, 1902, balance unexpended .....	\$320,389.59
June 30, 1903, amount expended during fiscal year .....	166.32
July 1, 1903, balance unexpended .....	320,223.27

### ABSTRACT OF APPROPRIATIONS.

By act of Congress approved March 3, 1899 .....	\$200,000
By sundry civil act approved June 6, 1900 .....	300,000
Total .....	500,000

"Of this amount \$10,000 was allotted by act of February 17, 1898, for survey of Southwest Pass, Mississippi River.



Date  
 Soundings May 11, 1902. Plans of reference 35  
 feet on average gate  
 Full lines represent Mahafeld sheet piling in place  
 Broken lines represent remaining portions of a  
 dam built by the Sals' representatives  
 20 ft. 25 ft. 30 ft.  
 Surveyed by G. B. Jones, Junior Engineer  
 Drawn by Allen E. Washburn, Junior Engineer



# APPENDIX U—REPORT OF LIEUT. COL. H. M. ATAMS. 1277

ABSTRACT OF CONTRACT IN FORCE DURING YEAR ENDING JUNE 30, 1903.

*For construction of dredge boat.*

Name and address of contractor: William R. Trigg Company, Richmond, Va.

Dated: 1901.

Approved: 1901.

Date of beginning: 1901.

Contract prices:

For hull and propelling machinery .....	\$252, 375
For pumps and machinery .....	32, 050
For electric-light plant.....	2, 180

Total .....	286, 605
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Contract annulled.

## COMMERCIAL STATISTICS.

For commercial statistics for the port of New Orleans, see report on "Maintenance of South Pass channel, Mississippi River."

## U 3.

### IMPROVEMENT OF THE SOUTHWEST PASS OF THE MISSISSIPPI RIVER.

A project for the expenditure of the amounts appropriated and for which contracts were authorized by the act of June 13, 1902, containing proposed modifications to project contained in House Document No. 329, Fifty-sixth Congress, first session, was submitted on August 7, 1902, and approved, with minor modifications, by the Secretary of War on April 6, 1903. This project contemplates the construction of a dredge, dredging, purchase of land, and construction of two jetties to be built of mattresses, stone, and concrete.

Bids for the construction of the two jetties were opened on June 30, 1903. Only two bids were received, which were submitted to the Chief of Engineers on the same day with recommendation that the lower bid, that of Christie & Lowe, Chicago, Ill., for \$2,175,896.60 be accepted. This recommendation was approved on July 7, 1903.

On August 1, 1902, a recommendation was submitted that all of the land below or south of Pilot Town, on the east bank, and all that below or south of the United States reservation on the west bank of Southwest Pass be acquired by condemnation for use in connection with the proposed improvement. This recommendation was approved by the Secretary of War on August 15, 1902, and it is understood that the local United States district attorney was instructed on October 29, 1902, to institute condemnation proceedings for the acquisition of this land. These proceedings were commenced in the local United States district court on May 21, 1903. On May 22, 1903, the owner of the lands submitted a proposition to accept \$5,000 for all the land claimed by him on Southwest Pass for which he had formerly asked \$250,000, and to pay the costs of the condemnation proceedings up to that time.

This proposition was submitted to the Attorney-General by the United States district attorney, recommended for acceptance, and was approved by the Secretary of War on June 22, 1903. Title to the land was acquired on July 10, 1903.

# 1278 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

## Money statement.

July 1, 1902, balance unexpended .....	\$750,000.00
Amount appropriated by sundry civil act approved March 3, 1903 ....	1,000,000.00
	<hr/>
June 30, 1903, amount expended during fiscal year .....	1,750,000.00
	208.88
July 1, 1903, balance unexpended .....	1,749,791.12
July 1, 1903, outstanding liabilities .....	14.40
	<hr/>
July 1, 1903, balance available .....	1,749,776.72
	<hr/>
{ Amount (estimated) required for completion of existing project.....	4,250,000.00
{ Amount that can be profitably expended in fiscal year ending June	
30, 1905, in addition to the balance unexpended July 1, 1903 .....	1,250,000.00
{ Submitted in compliance with requirements of sundry civil act of June	
4, 1897.	

## ABSTRACT OF APPROPRIATION

By act of Congress—	
Approved June 13, 1902.....	\$750,000
Approved March 3, 1903.....	1,000,000
	<hr/>
Total.....	1,750,000

## COMMERCIAL STATISTICS.

For commercial statistics for the port of New Orleans see report on "Maintenance of South Pass channel, Mississippi River."

## U 4.

### EXAMINATIONS AND SURVEYS AT SOUTH PASS, MISSISSIPPI RIVER.

In accordance with the provisions of the river and harbor act approved June 13, 1902, such examinations and surveys were made of the 14 miles of channel from the main river to the Gulf as were necessary for full information relative to the depth and width of channel. Four charts showing this channel accompany a report herewith of Mr. E. D. Jones, junior engineer.

The channel maintained was sufficient for all the demands of commerce, and compared very favorably in both depth and width with that during any previous year. During the fiscal year 73 ships drawing 26 feet or more navigated the pass, as compared with 16 during the previous year. The deepest draft was 28½ feet.

On January 1, 1903, in compliance with the requirements contained in river and harbor act of June 13, 1902, the plane of reference used in reducing soundings was changed from average flood tide to mean low tide.

*Statement of expenditures on account of appropriation for examinations and surveys at South Pass, Mississippi River, from July 1, 1902, to June 30, 1903, inclusive, made in compliance with the river and harbor act of June 13, 1902.*

Services .....	\$8,336.25
Repairs to launch <i>General Reese</i> .....	775.80
Lead line .....	3.75
	<hr/>
Total .....	9,115.80

# APPENDIX U—REPORT OF LIEUT. COL. H. M. ADAMS. 1279

## Money statement.

July 1, 1903, amount appropriated by river and harbor act of June 13, 1902, for fiscal year 1903 .....	\$10,000.00
June 30, 1903, amount expended during fiscal year .....	\$9,115.80
July 1, 1903, outstanding liabilities (for services) .....	884.20
July 1, 1903, total cost of operations during fiscal year .....	10,000.00

## U 5.

### MAINTENANCE OF SOUTH PASS CHANNEL, MISSISSIPPI RIVER.

For progress of the work see Annual Report of the Chief of Engineers for 1901, pages 1881 to 1887; also report for 1902, pages 1324 to 1332.

For convenience of reference the operations for the past fiscal year are given under subheadings.

### MAINTENANCE OF JETTIES AND AUXILIARY WORKS.

During the year repairs were made to Upper Dam, Cut-off dike, and West dike, at the Head of Passes. West dike was damaged by collision with the steamship *Lake Michigan* on December 25, 1902, and the strength and usefulness of this structure were also considerably impaired by undermining, caused, in a large degree, by the increased current flowing across Head of Passes as a result of the placing of the sill across Pass a Loutre in 1900. It is proposed to repair and strengthen this dike during the next low-water stage of the river.

The 37 wing dams in the jetty channel, 7 wing dams in Grand Bayou reach, 5 wing dams in Goat Island reach, and 1 wing dam in Port Eads reach have been maintained in good condition during the year by the addition of willows, stone, piles, and waling timber as required.

Three hundred and sixty feet of the crib at the sea end of the inner west jetty was raised 2 feet and partly filled with stone. The inner east jetty was repaired with willows and stone for a total distance of 4,500 feet.

In the work of the maintenance of the jetties and auxiliary works during the fiscal year 12,833.3 cords of willows, 3,447 cubic yards of stone, 485 piles, 13,333 linear feet of waling timber, 835 screw bolts, and 1,325 drift bolts were used.

On December 25, 1902, the steamship *Lake Michigan* ran into and damaged West dike at the head of South Pass, the estimated cost of repairing the damages being \$774.89; on March 1, 1903, the Italian steamship *Soperga* ran into and damaged wing dam No. 17, jetty channel, the cost of repairs being \$175; and on March 21, 1903, Dam No. 18, Grand Bayou reach, was damaged to the extent of \$190 by collision with the steamship *Venus*. In accordance with the provisions of section 14 of the river and harbor act of March 3, 1899, these cases were duly reported to the local United States district attorney, and the cost of repairing the damages was collected in each case and deposited to the credit of the appropriation.

## DREDGING.

The dredge *Beta* worked in South Pass from July 1 to September 30, 1902, when, the channel being in such condition as no longer to require her services, the dredge was returned to the Mississippi River Commission, leaving Port Eads for Memphis, Tenn., on October 4, 1902. The tender *Sachem* was repaired at New Orleans from October 9 to 19, 1902, inclusive, leaving on the latter date, with the *Beta* in tow, for Memphis.

The *Beta* was retransferred for work at South Pass in February, 1903, arriving at New Orleans on February 3, but not in condition for work. Repairs were made to the dredge and tender *Sachem* at New Orleans until February 13, when they left for South Pass, arriving on February 15. Repairs were continued at South Pass, and on February 25 the dredge was in condition to begin work. On account of the stage of the river and the condition of the channel but little dredging was required up to the end of the fiscal year, but the dredge has been held in readiness to remove any shoals that might appear in the channel. From April 3 to 27, inclusive, the *Beta* was engaged on the work of filling in the low ground of the reservation at Fort St. Philip, La., under authority of the Secretary of War, the funds for the work being supplied by the Quartermaster's Department.

From September 18 to October 17, 1902, the dredge *Sabine* was employed in removing a shoal that had formed in the channel beyond the ends of the jetties. The available channel depth was increased from 25.6 to 30 feet, with a width of 100 feet. When the river began rising in January, 1903, the channel beyond the ends of the jetties began to shoal and the *Sabine* was again transferred to South Pass. The dredge arrived on April 5 and began dredging on April 11. At the end of the fiscal year the *Sabine* was still engaged in dredging the channel in the Gulf beyond the ends of the jetties, the available channel depth having been increased from 25 to 28 feet.

## PURCHASE OF LAND.

On December 6, 1902, the legal representatives of the estate of James B. Eads, deceased, accepted the offer of \$35,000, made by the War Department November 11, 1902, for the lands and buildings owned by the estate on both sides of South Pass. The purchase price was approved by the Secretary of War December 11, 1902, and was paid into court and title secured for the United States on July 8, 1903.

The report, herewith, of Mr. E. D. Jones, junior engineer, is in detail and complete.

*Money statement.*

## PERMANENT APPROPRIATION.

July 1, 1902, amount appropriated by emergency river and harbor act, approved June 6, 1900, for fiscal year 1903.....	\$100,000.00
Amounts collected and deposited by United States district attorney for damages to works .....	1,139.89
	<hr/> 101,139.89
June 30, 1903, amount expended during fiscal year .....	\$101,039.89
June 30, 1903, outstanding liabilities.....	100.00
	<hr/> 101,139.89

# APPENDIX U—REPORT OF LIEUT. COL. H. M. ADAMS. 1281

## APPROPRIATION MADE BY RIVER AND HARBOR ACT OF JUNE 13, 1902.

July 1, 1902, balance unexpended.....	\$75,000.00
June 30, 1903, amount expended during fiscal year.....	\$24,918.57
June 30, 1903, outstanding liabilities.....	43,261.13
	<hr/> 68,179.70
July 1, 1903, balance available .....	6,820.30

## ABSTRACT OF APPROPRIATIONS.

### Maintenance.

By act of Congress—	
Approved June 6, 1900 (indefinite), \$100,000 annually .....	\$300,000.00
Approved June 6, 1900 (allotted).....	10,000.00
Approved June 13, 1902.....	75,000.00
	<hr/> 385,000.00
Reverted to Treasury .....	58,337.52

## ABSTRACT OF CONTRACTS IN FORCE DURING THE YEAR ENDING JUNE 30, 1903.

Name and address of contractor: Oscar F. Barrett, Cincinnati, Ohio.  
 Work: Furnishing and delivering 7,000 cubic yards of stone on the bank in South Pass, at \$3.75 per cubic yard.  
 Dated: January 5, 1903.  
 Approved: January 19, 1903.  
 Date of expiration: April 7, 1903 (time limit waived).  
 Date of completion: May 8, 1903.

### Emergency contract.

Name and address of contractor: The Johnson Iron Works, Limited. New Orleans La.  
 Work: Furnishing new boiler and repairing U. S. Tug *Sturtle*.  
 Contract price: \$3,895.  
 Dated: December 19, 1902.  
 Date of expiration: May 29, 1903.  
 Date of completion: May 29, 1903.

## COMMERCIAL STATISTICS FROM JANUARY 1, 1902, TO DECEMBER 31, 1902.

### Port of New Orleans, La.

[From information furnished by collector of port of New Orleans.]

Class.	Entered.		Cleared.	
	Number.	Tonnage.	Number.	Tonnage.
FOREIGN-BOUND VESSELS.				
Steamers.....	901	1,439,767	1,002	1,750,051
Sailing vessels .....	67	89,071	43	36,337
COASTWISE VESSELS.				
Steamers.....	345	877,891	245	595,770
Sailing vessels .....	33	12,630	34	7,580
Total.....	1,346	2,369,859	1,830	2,389,738



# 1282 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

## Foreign exports and imports.

Articles.	Year ending December 31, 1902.	
	Tons.	Value.
<b>EXPORTS.</b>		
Cotton .....	492,932	\$82,255,802
Cotton-seed oil .....	25,664	2,797,815
Cotton-seed cake and meal .....	293,398	6,944,850
Corn .....	69,216	1,425,174
Wheat .....	469,912	11,747,000
Wheat flour .....	60,004	2,895,478
Oats .....	5,716	177,418
Horses and mules .....	27,918	3,792,807
Leaf tobacco .....	19,158	3,785,087
Boards, deals, etc. ....	149,396	2,027,914
Staves .....	170,466	2,961,685
Other lumber and manufactures of .....	117,862	1,178,620
Lard and lard compounds .....	4,083	819,876
Beef, canned .....	3,885	773,265
Miscellaneous .....	162,869	4,871,074
Total exports .....	2,071,399	127,939,514
<b>IMPORTS.</b>		
Coffee .....	58,506	6,571,085
Cement .....	29,898	183,886
Salt .....	5,087	28,294
Sugar .....	156,828	5,231,778
Fruits and nuts .....	151,246	2,299,547
Sisal grass and Tampico fiber .....	27,435	2,991,888
Fibers and textiles, manufactures of .....	31,052	3,038,132
Cotton fabrics .....	13,513	350,565
Chemicals, drugs, dyes, etc. ....	3,806	201,082
Wines, brandy, liquors, beer, etc. ....	694	363,568
Cotton ties .....	1,113	34,471
Iron and steel, manufactures of .....	13,659	377,586
Tobacco, leaf and cigars .....	108	262,315
Mattings (floor) .....	2,252	218,176
Fertilizers .....	5,368	84,888
Earthen, glass, and china ware .....	1,488	149,778
India rubber, crude .....	182	225,161
Miscellaneous .....	7,580	1,507,002
Total imports .....	510,249	25,372,156
Total exports and imports .....	2,581,648	153,311,670

## Domestic shipments and receipts by Southern Pacific Line of Steamers (formerly Cromwell and Morgan lines).

Articles.	Year ending December 31, 1902.	
	Tons.	Value.
<b>SHIPMENTS.</b>		
Grain .....	45,722	\$1,182,371
Cotton .....	78,690	12,590,400
Lumber .....	22,700	555,014
Iron, steel, and metals .....	51,520	2,576,000
Sugar .....	126,429	10,114,320
Manufactured products and merchandise .....	27,220	3,192,796
Agricultural products .....	5,389	125,833
Miscellaneous .....	87,726	3,209,755
Total shipments .....	445,396	33,546,488
<b>RECEIPTS.</b>		
Grain .....	42	1,086
Lumber .....	204	4,988
Iron, steel, and metals .....	93,734	4,686,700
Sugar .....	22,581	3,532,960
Manufactured products and merchandise .....	171,271	20,182,851
Agricultural products .....	4,531	97,870
Miscellaneous .....	66,279	2,523,254
Total receipts .....	358,642	31,029,709
Total shipments and receipts .....	804,038	64,576,197

## REPORT OF MR. E. D. JONES, JUNIOR ENGINEER.

PORT EADS, LA., July 1, 1903.

SIR: I have the honor to report upon the maintenance of South Pass channel, Mississippi River, for the fiscal year ending June 30, 1903.

The work consisted of maintaining the existing jetties, dikes, dams, etc., dredging where otherwise a channel of 30 feet or more in depth could not be maintained, repairing and renewing the plant, and examinations and surveys of the channel from deep water in the Mississippi River through South Pass to deep water in the Gulf.

The conditions during the recent high stage of the river were unprecedented. The stage of the river, as shown by the Head of Passes gauge, for the months of March and April, 1903, was 0.4 of a foot above the preceding highest stage in 1897. This extra head caused a much swifter current at the Head of Passes and in South Pass than any previous high river, and the results were what could be expected. The scour was most noticeable around the works at the Head of Passes and in the jetty channel. The shoaling beyond the ends of the jetties was as marked as the scour in the pass.

## MAINTENANCE OF JETTIES, DIKES, DAMS, ETC.

## AT HEAD OF SOUTH PASS.

**Upper Dam.**—This structure was 416 feet long. A row of piles was driven along the upper side, and the dam was otherwise strengthened by waling timber and ties, and the whole structure filled with willows.

On December 29, 1902, 40 feet of the west end was carried away by the strong current. This was repaired, the end being left at an angle of about 45° with the face of the dam, making it more nearly parallel with the current. The lower point is 20 feet inside of the old end, making the present length 396 feet. This new work was filled with willows which were ballasted with stone, the willows in the rest of the dam being ballasted with earth.

**Cut-off dike.**—This dike extends from Upper Dam down to the mainland, and stops all wash and current between South Pass and Pass a Loutre. Its use is not now so important since the made (or built up) land below Upper Dam has become covered with a growth of willows, but it has been maintained as a safeguard against cross currents during storms and high river.

On February 20, 1903, about 100 feet of this dike was carried away by a cave in the bank. It was repaired immediately, but on March 20 a second cave in the bank carried away about 60 feet of the new work, leaving a hole 55 feet deep under the dike.

If the west end of Upper Dam and the shore for a distance of 500 feet below it were protected by a willow mattress it would not be necessary to maintain the cut-off dike.

**West dike.**—This structure is really a west jetty at the head of South Pass. It was rebuilt and put in good condition in December, 1902.

On December 25, 1902, the outbound steamship *Lake Michigan*, drawing 26½ feet, went aground near by, then swung against this dike; 25 feet of the dike was demolished and the next 75 feet was considerably damaged. As the river was rising, only temporary repairs could be made at the time.

On February 20, 1903, the tug *Monarch* and oil barge *Ludwig*, outbound, were driven to westward by strong wind and current, and struck the dike near the upper end. The damage was thought to be very little at the time, but later, under the pressure of the strong current, it gave way until the present end is about 100 feet below the original end.

The current undermined the row of piles on the South Pass side for a distance of 155 feet.

During the low stage of the river this dike should be repaired. The upper end should be left in its present position, as a permanent shoal is caused in South Pass by the dike extending farther up; and it should also be protected by a willow mattress.

## IN SOUTH PASS.

**Section 305-315 (Goat Island reach).**—In this reach there are five wing dams on the east shore of the pass, which contract the width and assist the current in maintaining a channel through the reach. They were all repaired and put in good condition.

**Section 155-210 (Grand Bayou reach).**—This is the widest in South Pass. The channel crossing from the west to the east shore in this reach makes it more difficult to

# 1284 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

maintain a good channel. There are seven wing dams along the east shore of the pass, and all have been put in good condition.

On March 15, 1903, the steamship *Venus*, outbound, in coming to anchor on account of disabled machinery, struck Dam No. 18 and wrecked 40 feet of the outer end.

By increasing the number of dams in this reach the channel could be made practically self-sustaining. At present there are no dams on the west shore.

## AT THE MOUTH OF SOUTH PASS.

*East and west jetties.*—There was no perceptible change in the condition of the east or west jetty, and no work was done on them during the year.

*Inner west jetty.*—Three hundred and sixty feet of the crib at the sea end of inner west jetty was raised 2 feet and partly filled with stone. The remaining 500 feet will be raised during the coming year; protection piles will also be driven around the end of the jetty.

*Inner east jetty.*—This jetty was repaired with willows and stone from a point 175 feet below Dam No. 21 up to 250 feet above Dam No. 42, and from the sea end up to Dam No. 8, a total distance of 4,500 feet. Some additional stone will have to be placed on the willows between Dams Nos. 42 and 43, also between Dams Nos. 8 and 47. The crib below Dam No. 47 was repaired and filled with stone. Ninety-five feet of the crib between east jetty and inner east jetty, at the sea end, was repaired and filled with stone.

*Wing dams in jetty channel.*—There are 37 wing dams in this reach. Nearly all of them were repaired during the year, and all are in good condition. Four of them were struck by steamers during the year, only one being damaged to any amount.

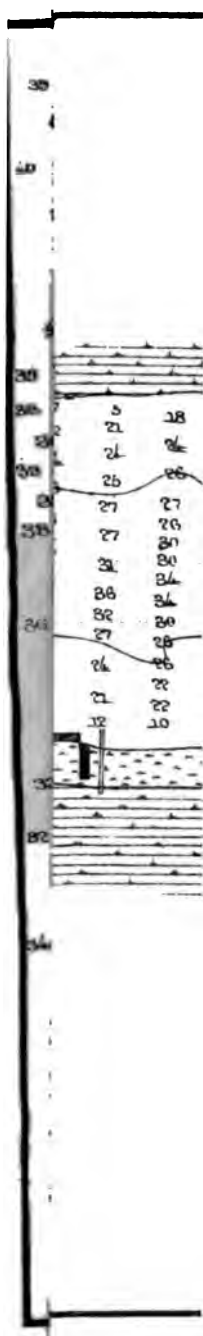
The following is a statement of labor and material expended in the maintenance of South Pass channel, Mississippi River, and where used:

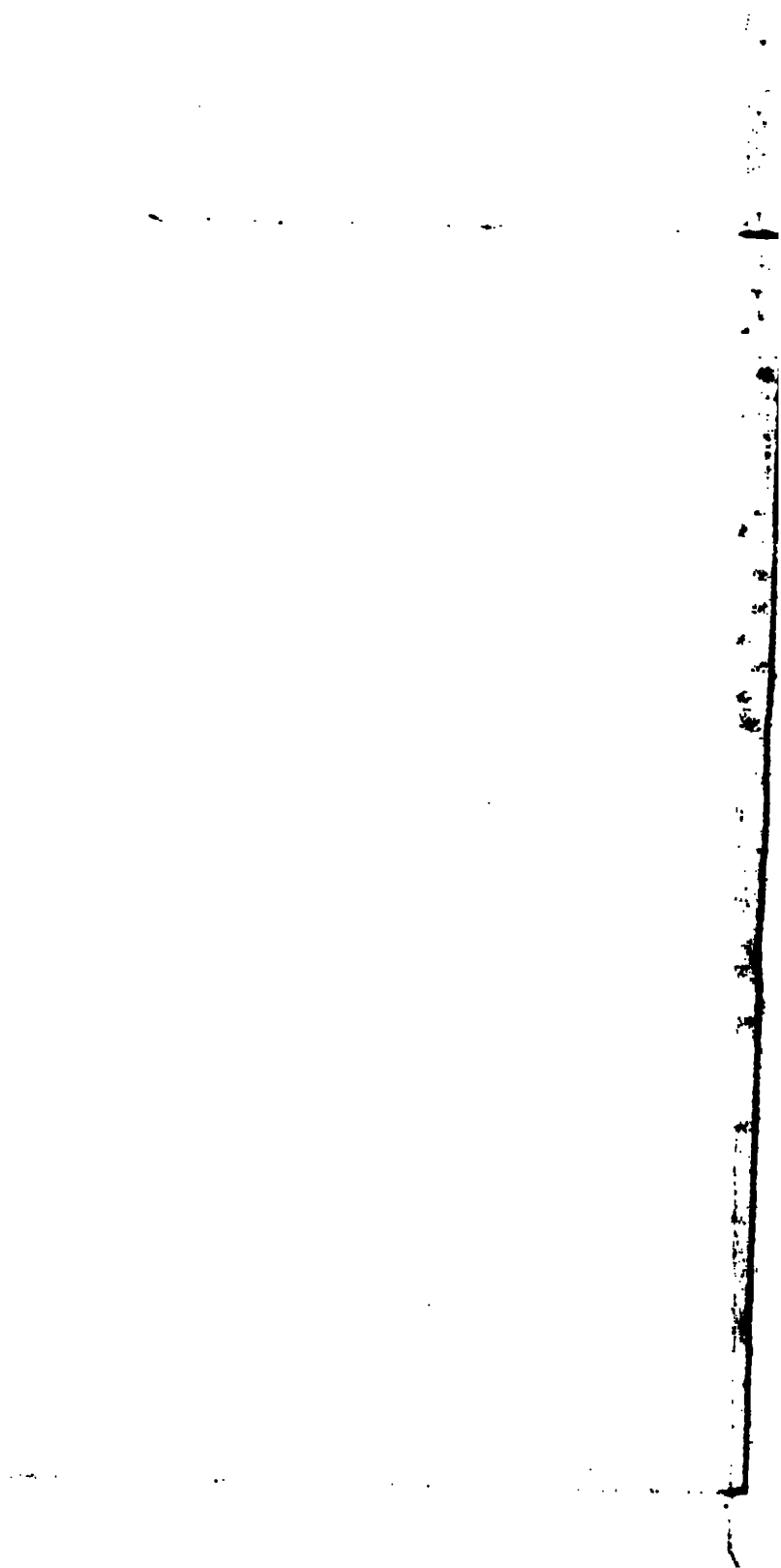
Where used.	Labor.	Willows.	Stone.	Piles.	Waling timber.	Screw bolts.	Drift bolts.
	Hours.	Cords.	Cu. yds.	No.	Lin. feet.	No.	No.
Upper Dam, Head of Passes.....	2,332.5	1,442.7	40	107	900	139	.....
Cut-off dike, Head of Passes.....	685	414.8	.....	43	300	59	.....
West dike, Head of Passes.....	5,067.5	2,453.8	19	175	2,230	352	.....
West shore, South Pass, section 289..	126	60	39	.....	.....	.....	.....
Dams in section 305-315.....	306	116.4	.....	17	380	46	.....
Dams in section 155-210.....	1,089.5	724	79	95	940	149	.....
Dams in jetty channel.....	1,985.5	1,168.5	355	37	560	74	.....
Inner east jetty.....	13,646	6,453.1	2,442	.....	908	.....	217
Inner west jetty.....	856	Plank, 2½ inches by 12 inches by 20 feet.	67	.....	3,360	.....	724
Crib at end inner east jetty.....	868	120	406	.....	3,575	.....	384
Mooring piles and landing.....	63	10	.....	11	180	16	.....
Repairing plant.....	232	.....	.....	.....	.....	.....	.....
Building derrick barge.....	1,266.5	.....	.....	.....	.....	.....	.....
Installing machinery on derrick barge.....	484.5	.....	.....	.....	.....	.....	.....
Unloading ballast.....	161.5	.....	.....	.....	.....	.....	.....
Piling lumber, etc.....	243.5	.....	.....	.....	.....	.....	.....
Cleaning premises.....	314.5	.....	.....	.....	.....	.....	.....
Coaling, etc., on dredges.....	735	.....	.....	.....	.....	.....	.....
Extra labor on boats.....	510	.....	.....	.....	.....	.....	.....
Grinding tools.....	17	.....	.....	.....	.....	.....	.....
Lost on account of rain.....	662	.....	.....	.....	.....	.....	.....
Total.....	31,651.5	12,833.3	3,447	485	13,333	835	1,325

## DREDGING.

The dredge *Beta* worked in South Pass from July 1 to September 30, 1902. On October 1, 1902, preparations were begun for returning to Memphis, Tenn., and the *Beta* left Port Eads on October 4, 1902.

On February 15, 1903, the *Beta* returned to Port Eads, but on account of the stage of the river and the condition of the channel dredging was not necessary until March 20, when the dredge was moved to sections 155-210; but, as the amount of work was not commensurate with the cost, dredging was discontinued from March 30 to April 27, 1903. During this latter period the *Beta* was at Fort St. Philip, La. The dredge













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CHART  
OF THE  
**HEAD & PASSES,**  
**MISSISSIPPI RIVER**

*showing location of jetties, dikes, dams, etc.*

**SUPERSEPPLOYER**

**UNDER THE DIRECTION OF**

**Lieut. Col. H.M. Adams, Corps of Engineers USA**

**BY**

**C. Donovan, Asst. Engr.**



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left South Pass for Fort St. Philip on April 8, arrived at Fort St. Philip on April 9, and returned to South Pass on April 27, 1903. From May 2 to 22, inclusive, the dredge worked continuously at section 155-210. Since that date it has been necessary to dredge but a few hours each week to dispose of the small shoals that appear from week to week.

The stage of the river being from 2 to 3 feet above the plane of reference, it was not practicable to dredge at times when the reports showed a channel less than 30 feet in depth.

*Operations of dredge Beta for year ending June 30, 1903.*

Locality.	Dredging.	Moving for steamers.	Arranging plant and repairs.	Laying at bank.	Cut made.		
					Length.	Width.	Depth.
	<i>h.</i> <i>m.</i>	<i>h.</i> <i>m.</i>	<i>h.</i> <i>m.</i>	<i>Days.</i>	<i>Feet.</i>	<i>Feet.</i>	<i>Feet.</i>
Section 305-315 .....	48 15	8 50	26 55	.....	3,350	25	3.5
Section 155-210 .....	171 15	60 55	358 05	73	38,800	40	3.5
Section 20-50 .....	141 20	24 35	133 55	.....	14,075	50	4.5
Port Eads reach .....	69 00	9 20	53 40	.....	9,550	50	4.5
Jetty channel .....	82 10	15 15	82 35	.....	5,500	45	5.0
Total .....	512 00	118 55	655 10	73	71,275	.....	.....

*Sabine.*—On September 12, 1902, the available depth of water in the channel beyond the ends of the jetties being but 25.6 feet, the dredge *Sabine* was sent to this place from Sabine Pass, Tex. Arriving on September 17, 1902, dredging in the channel beyond the ends of the jetties was begun on September 18, and continued until October 17, 1902. A channel 30 feet in depth and 100 feet in width was then obtained.

The dredge *Sabine* left for New Orleans for repairs on October 18, 1902.

When the river began rising in January, 1903, the channel beyond the ends of the jetties began to shoal. On March 20, 1903, the available depth was 27.5 feet; on April 11 it was 25 feet.

The dredge *Sabine* returned to Port Eads on April 5, 1903, and after changing the furnaces from oil to coal burning began dredging in the channel beyond the ends of the jetties on April 11, 1903. Operations have been continued in that locality since that date.

*Operations of dredge Sabine for year ending June 30, 1903.*

Locality.	Moving to and from dredging position.	Pump- ing.	Dump- ing.	Repairs.	Number of loads.
	<i>h.</i>	<i>h.</i>	<i>h.</i>	<i>h.</i> <i>m.</i>	
Beyond the jetties.....	82	625	191	52 45	1,148

EXAMINATIONS AND SURVEYS.

Weekly surveys were made of the shoaler localities in South Pass, monthly surveys were made of the jetty channel and the channel beyond the ends of the jetties to deep water in the Gulf, and a detailed annual survey was made of the 14 miles of channel from the main river to deep water in the Gulf, the charts of which accompany this report.

By command of the Chief of Engineers, under date of December 6, 1902, the planes of reference for soundings were changed from "average flood tide" to "mean low tide," this to conform to act of June 13, 1902. The change became effective on January 1, 1903.

The present planes are indicated by a reading of 3.1 feet on Port Eads gauge for all soundings from deep water in the Gulf up to a point 5 miles above South Pass light and by a reading of 1.96 feet on Head of Passes gauge for the remaining distance up to deep water in the Mississippi River.

The old planes of reference were 4.2 feet on Port Eads gauge for all soundings below East Point and 2.4 feet on Head of Passes gauge for all soundings above East Point.

# 1286 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

The following table gives the depth of water through the shoaler reaches in South Pass, the jetty channel, and the channel beyond the ends of the jetties:

Date.	Beyond jetties.				Jetty channel.				Port Eads reach.			
	Available depth.	Available width of channel.			Available depth.	Available width of channel.			Available depth.	Available width of channel.		
		26 feet.	28 feet.	30 feet.		26 feet.	28 feet.	30 feet.		26 feet.	28 feet.	30 feet.
1902.	<i>Feet.</i>	<i>Feet.</i>	<i>Feet.</i>	<i>Feet.</i>	<i>Feet.</i>	<i>Feet.</i>	<i>Feet.</i>	<i>Feet.</i>	<i>Feet.</i>	<i>Feet.</i>	<i>Feet.</i>	<i>Feet.</i>
July.....	26.7	100	.....	.....	28.8	155	80	.....	30.5	265	137	65
August.....	27.5	265	.....	.....	28.5	160	110	.....	30	225	100	15
September.....	25.6	.....	.....	.....	29.4	160	110	.....	29.3	220	115	.....
October.....	28.7	210	100	.....	29.9	170	120	.....	30.6	175	110	45
November.....	31.1	225	150	100	28.4	140	115	.....	30.7	160	110	65
December.....	31.1	300	180	140	28.7	160	115	.....	30.3	185	90	30
1903.												
January.....	29.2	240	100	.....	30	190	160	50	30.2	235	135	40
February.....	28.2	220	110	.....	31.2	185	170	100	29.6	230	80	.....
March.....	26.6	60	.....	.....	33	215	190	135	30.5	240	130	85
April.....	25	.....	.....	.....	33	210	170	110	32.1	200	125	90
May.....	27.7	90	.....	.....	33	210	.....	150	32.3	240	165	70
June.....	28	145	.....	.....	32.8	205	175	135	30	.....	.....	.....
Date.	Section 20-50.				Section 155-210.				Section 305-315.			
	Available depth.	Available width of channel.			Available depth.	Available width of channel.			Available depth.	Available width of channel.		
		26 feet.	28 feet.	30 feet.		26 feet.	28 feet.	30 feet.		26 feet.	28 feet.	30 feet.
1902.	<i>Feet.</i>	<i>Feet.</i>	<i>Feet.</i>	<i>Feet.</i>	<i>Feet.</i>	<i>Feet.</i>	<i>Feet.</i>	<i>Feet.</i>	<i>Feet.</i>	<i>Feet.</i>	<i>Feet.</i>	<i>Feet.</i>
July.....	28.1	225	60	.....	28.5	230	110	.....	28.5	267	185	.....
August.....	29.5	190	70	.....	30	230	150	25	30.1	236	185	80
September.....	29.7	270	150	.....	29.3	235	140	.....	29.6	236	200	.....
October.....	30.5	260	150	30	29.7	240	165	.....	30.6	230	200	80
November.....	29.6	215	105	.....	28.6	180	120	.....	29.5	235	200	.....
December.....	23.5	210	120	.....	28.5	180	90	.....	29.7	230	190	.....
1903.												
January.....	28.1	220	105	.....	29	225	125	.....	29.2	255	180	.....
February.....	29.1	270	135	.....	29.2	250	110	.....	28.3	235	130	.....
March.....	31.9	265	195	150	29	250	140	.....	30.9	310	150	90
April.....	29.2	240	170	.....	27.4	180	.....	.....	29.4	310	220	.....
May.....	30.7	230	170	100	26.4	120	.....	.....	29.1	400	235	.....
June.....	31.7	300	210	120	27.2	285	.....	.....	28.4	430	220	.....

## THE PLANT.

The floating plant consists of 1 tug, 2 steam launches, 1 pile driver, 1 derrick boat, 8 barges, 1 yawl boat, and 4 skiffs.

The tug *Sturtle* and launch *General Reese* were docked and painted, a new boiler and tail shaft placed in each, and other minor repairs made. The launch *Udell* was docked and painted and a new engine, tail shaft and wheel installed. The hull of the derrick boat became unserviceable and a new hull was built and launched June 2, 1903; the machinery is now being transferred from the old barge to the new one. The barges were repaired and kept in serviceable condition.

## THE FORCE EMPLOYED.

The permanent force consists of 2 junior engineers, 1 overseer, 1 master, 3 steam engineers, 1 carpenter, 1 leadman, 1 stoker, 4 deck hands, 1 gauge observer, and 1 watchman, being 16 in number. The laboring force averaged 11 men.

## NAVIGATION OF THE CHANNEL.

Four features in connection with the navigation of the 14 miles of channel are worthy of notice.

(1) *Condition of channel.*—At the head of South Pass and throughout its entire length to the sea ends of the jetties the channel compared very favorably, in both depth and width, with that of any previous year. During the period of high river,

when moving sand caused irregularities in the channel, the water surface remained sufficiently above the low-water plane to insure safe navigation. There is no record of any vessel going aground while in the pass, and but one—the steamship *Lake Michigan*—at the head of the pass; and this one case was not due to any deficiency in the channel. All damage done to wing dams by vessels was by those which were entirely out of the channel.

At times during the year the channel beyond the ends of the jetties was not adequate to the demands of commerce, and required close attention. On account of the heavy deposit of sediment the channel was irregular and unstable. Three vessels while in the channel grounded so firmly as to require assistance.

(2) *Fogs*.—Navigation was impeded, and on several occasions entirely suspended, by dense fogs. On account of the early rise of the river fogs occurred with greater frequency and throughout a longer period than is common at this point. The grounding of four or more vessels in the vicinity of the ends of the jetties should be attributed to this cause.

(3) *Current*.—The unprecedented current during the high river caused difficulty in entering the pass at either end.

The set of the current across the head of South Pass and into Southwest Pass caused two cases of vessels colliding with the structure known as "West dike."

At the sea entrance to the jetties, where considerable change in course is necessitated by the encroachment on the channel by the shoal to westward, the current has been a serious factor in navigation. There are records of seven vessels grounding near the west jetty light, having failed to "straighten up" after reaching the ends of the jetties.

(4) *Increase in draft of steamers*.—During the fiscal year ending June 30, 1903, 73 ships navigated the pass drawing 26 feet or more, as compared with 16 during the previous year. The greatest drafts have been tabulated, as follows:

1 drawing 28½ feet.  
3 drawing 28 feet.  
3 drawing 27½ feet.  
20 drawing 27 feet and less than 27½ feet.  
46 drawing 26 feet and less than 27 feet.  
Also 66 drawing 25 feet and less than 26 feet.

Very respectfully, your obedient servant,

Lieut. Col. H. M. ADAMS,  
*Corps of Engineers.*

E. D. JONES, *Junior Engineer.*

## U 6.

### IMPROVEMENT OF BAYOU LAFOURCHE, LOUISIANA.

During the past fiscal year dredging has been done for the maintenance of low-water navigation, under emergency contract entered into with John J. Keegan, dated August 6, 1902. Work was commenced at head of bayou on September 5, 1902, and continued until December 13, 1902, when the stage of water was such as to render dredging unnecessary. The dredge, with a double crew, was furnished for \$68 per day of sixteen hours. The operations of the dredge extended over a distance of 4½ miles, and actual dredging was done for about 2½ miles. Nine bars and 54 obstructions were removed from the stream, the amount of material dredged being 49,380 cubic yards. The dredge was employed 84½ days.

No estimate for additional funds for this work is asked, as Congress has authorized the construction of a lock and dam at the head of the bayou by a State levee board.

#### *Money statement.*

July 1, 1902, balance unexpended .....	\$8, 473. 43
June 30, 1903, amount expended during fiscal year .....	6, 351. 28
July 1, 1903, balance unexpended and available .....	2, 122. 15



# 1288 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

## ABSTRACT OF APPROPRIATIONS.

By act of Congress—		By act of Congress—	
Approved June 13, 1878.....	\$10,000	Of August 18, 1894.....	\$40,000
Approved March 3, 1879....	10,000	Passed June 3, 1896.....	25,000
Approved June 14, 1880....	5,000	Approved March 3, 1899	
Approved July 5, 1884.....	5,000	(maintenance).....	7,500
Of August 11, 1888.....	50,000	Approved June 13, 1902	
Approved September 19,		(maintenance).....	7,500
1890.....	50,000	Total.....	260,000
Approved July 13, 1892....	50,000		

## ABSTRACT OF CONTRACTS IN FORCE DURING YEAR ENDING JUNE 30, 1903.

### For dredging and removing obstructions.

Name and address of contractor: John J. Keegan, New Orleans, La.  
 Work: Furnishing dredge boat and crew, at \$68 per day of sixteen hours.  
 Dated: August 6, 1902.  
 Date of beginning: September 5, 1902.  
 Date of completion: December 13, 1902.

## COMMERCIAL STATISTICS, FROM JANUARY 1, 1902, TO DECEMBER 31, 1902.

### Vessels entering and departing.

	Number.	Trips.	Net registered tonnage.
Steamers.....	28	540	44,987
Sailing vessels.....	19	194	1,940
Barges.....	18	1,201	154,524
Total.....	65	1,935	201,451

Draft of heaviest vessel: Light, 2 feet; loaded, 9 feet.

### Shipments and receipts by water.

Articles.	Tons.	Value.
<b>SHIPMENTS.</b>		
Merchandise.....	7,928	\$594,540
Cotton and cotton-seed products.....	300	24,600
Rice.....	447	22,350
Flour and meal.....	180	4,500
Sugar and molasses.....	34,358	2,013,185
Moss.....	200	8,000
Potatoes.....	2,747	68,676
Total.....	46,160	2,735,850
<b>RECEIPTS.</b>		
Crude oil.....	42,300	143,830
Coal.....	38,300	184,050
Merchandise.....	5,985	448,575
Total.....	86,585	726,745
Grand total.....	132,745	3,462,595

## U 7.

IMPROVEMENT OF BAYOU PLAQUEMINE AND GRAND RIVER AND  
PIGEON BAYOUS, LOUISIANA.

For a detailed record of the improvements see Annual Report of the Chief of Engineers for 1896, pages 1496-1500; for 1897, pages 1759-1760; for 1898, pages 1471-1472; for 1900, pages 2251-2258; for 1901, pages 1890-1898; for 1902, pages 1334-1340.

The river and harbor act of June 3, 1896, authorized continuing contracts to be entered into to complete the project, not to exceed \$1,173,250, exclusive of amounts therein and previously appropriated. This entire amount, with the exception of \$13,250, has since been appropriated by Congress.

For convenience of reference the operations for the past fiscal year are given under subheadings.

## PLAQUEMINE LOCK.

The foundation for this lock was completed December 31, 1897, under contract with E. A. Burriss, dated June 24, 1895.

A contract amounting approximately to \$501,757.60, for constructing the lock and excavating approaches, was entered into with Stewart & Co. on May 28, 1898, to be completed by June 30, 1903. Preliminary work was commenced in August, 1898, and construction work on February 2, 1899.

At the end of the last fiscal year the following work on the lock had been completed: All of the masonry, with the exception of recesses left in the lock walls for the operating machinery; 5 miter sills; the top anchorages for the main gates; 3 rows of snubbing hooks; 20 inlet pipes placed.

There has been no actual work under this contract during the last two fiscal years.

In accordance with instructions from the Chief of Engineers, supplemental contract was entered into with the contractors, Stewart & Co., on June 18, and approved by the Secretary of War on June 24, 1903, providing for the annulment of their contract for construction of lock and approaches upon the payment to the contractors of the retained percentage and other items claimed by them, aggregating \$24,236.40.

A revised project providing for the completion of the lock and approaches was approved June 12, 1903. This project contemplates entering into two separate contracts, one to include the gates, iron work, and necessary work on miter sills, and the other to include the excavation of the two end approaches, the back fill behind the lock walls, and the construction of the two approaches. The specifications for this work were approved June 11, 1903.

On August 9, 1900, a crack in the floor of the lock began to develop, owing to settlement of the walls. Frequent levels have been taken since that date, and it is thought that the settlement has now about ceased.

For testing purposes 100 tons of pig iron were placed on one pivot stone of the gates in July and a second 100 tons on another pivot stone in November, 1901, and removed in May, 1902.

## 1290 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

No work has been done under contract entered into November 18, 1899, with the Otis Elevator Company for constructing and installing operating machinery and power house at a cost of \$114,000. The commencement of this work is contingent upon completion of the lock.

The purchase of 1.25 acres of land on the north side of the river approach to the lock for \$3,500 and 0.31 acre on the south side of the river approach for \$4,000 was completed August 24, 1900. This land was required for the approach to the lock.

A contract with John Short for construction of a protection levee was entered into April 23 and approved May 5, 1902. The work was completed in July, 1902.

During the past fiscal year no work has been done under the contract with Charles Clarke & Co., dated July 15, 1903, for the rectification of Bayou Plaquemine. There is included in this contract 1,027,500 cubic yards of excavation, of which amount 402,630 cubic yards had been removed to June 5, 1902, since which date no work has been done. The contract time for completion of this contract has been waived for a reasonable period. The contractors have been notified that they must proceed with the work.

### GRAND RIVER AND PIGEON BAYOUS.

These streams form part of the Plaquemine all-water route, connecting a number of navigable streams of Louisiana with the Mississippi River, and their improvement was added to the general project by act of July 13, 1892.

Dredging and snagging operations were carried on in these streams from 1893 to 1897, but obstructions continued to form.

Dredging and snagging operations were carried on in Grand River from June 30, 1900, to April 20, 1901, from a point  $3\frac{1}{4}$  miles above Bayou Pigeon, in that stream, and on down toward Bayou Posteo. A bar at the mouth of Bay Natchez was also removed.

A survey of Grand River from Pigeon Bayou to the Atchafalaya River near Morgan City, through Bay Natchez, Bayou Long, and Flat Lake, was completed March 25, 1901. A project was approved April 20, 1901, and modified March 21, 1902, for dredging channel through Flat Lake and Bay Natchez, and a contract with Charles Clarke & Co. was entered into April 3 and approved May 1, 1902, for dredging a 50-foot channel, at 20 cents per cubic yard. The work was commenced in Flat Lake July 5 and in Bay Natchez August 7, 1902, and 282,122 cubic yards of material removed to June 30, 1903. Channels 50 feet wide and 10 feet deep for a distance of 9,733 feet in Flat Lake and 24,538 feet in Bay Natchez were excavated, the channel through Flat Lake being completed on January 30, 1903. Eighty-two piles were driven in Bay Natchez and Flat Lake for the purpose of marking channel.

### BANK PROTECTION.

During the past year there has been no additional caving of the banks of the Mississippi River in the vicinity of the Plaquemine Lock.

One of the results of the high water in the Mississippi River during the past year was to erode and cut away the bank near the site of the lock. It is recommended that a mattress 600 by 400 feet be placed in the river in front of the lock site at an estimated cost of \$35,000. An estimate for these funds is submitted.

The work done during the year is fully described in the accompanying report of Mr. J. I. Conklin, assistant engineer, at Plaquemine, La., to which attention is invited.

It is proposed to expend the available balance to the credit of this appropriation in completing the lock and approaches, dredging in Bayou Plaquemine and in Bay Natchez, Louisiana.

*Money statement.*

July 1, 1902, balance unexpended .....	\$695,007.97
June 30, 1903, amount expended during fiscal year .....	68,023.42
July 1, 1903, balance unexpended .....	626,984.55
July 1, 1903, outstanding liabilities .....	11,948.20
July 1, 1903, balance available .....	615,036.35
July 1, 1903, amount covered by uncompleted contracts .....	245,316.06
<hr/>	
{ Amount that can be profitably expended in fiscal year ending June 30, 1905, for maintenance of improvement in addition to the balance unexpended July 1, 1903. ....	
{ Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899. ....	
	35,000.00

ABSTRACT OF APPROPRIATIONS.

By act of Congress—		By sundry civil act approved—	
Of August 11, 1888.....	\$100,000	June 4, 1897.....	\$350,000
Approved September 19, 1890.....	100,000	March 3, 1899.....	400,000
Approved July 13, 1892....	150,000	June 6, 1900.....	200,000
Of August 18, 1894.....	110,000	March 3, 1901.....	210,000
Of June 3, 1896.....	20,000	Total .....	1,640,000

ABSTRACT OF CONTRACTS IN FORCE DURING THE YEAR ENDING JUNE 30, 1903.

*For constructing lock and approaches.*

Name and address of contractor.	Dated.	Approved.	Date of beginning.	Date of expiration.
Stewart & Co., St. Louis, Mo.....	May 28, 1898	June 17, 1898	Aug. 16, 1898	June 30, 1903

Items.	Approximate quantities.	Prices.	Amounts.
Concrete.....	cubic yards..	84.713	\$3.37
Granite.....	cubic feet..	6.304	2.00
Medium steel.....	pounds..	1,788.019	.03 <sup>1</sup> / <sub>2</sub>
High steel, forged.....	do.....	16.600	.09 <sup>1</sup> / <sub>2</sub>
High steel, cast.....	do.....	206.372	.07 <sup>1</sup> / <sub>2</sub>
Cast iron.....	do.....	125.342	.03
Bronze.....	do.....	275	.32
Iron pipe, 14-inch.....	linear feet..	1.565	.50
Timber.....	feet B. M..	1.273	30.00
Sluice valves.....	each.....	16	78.75
Excavation.....	cubic yards..	300,000	.87
Total .....			501,757.60
Amount performed to June 24, 1903.....			306,975.85

Annulled by supplemental contract entered into by direction of the Chief of Engineers, dated June 18, approved by the Secretary of War June 24, 1903, providing for abrogation of contract and payment to the contractors of retained percentage and other items claimed by them aggregating \$24,982.37.

## 1292 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

### *For constructing operating machinery and power house for lock.*

Name and address of contractor.	Dated.	Approved.	Date of beginning.	Date of expiration.
Otis Elevator Co., New York, N. Y.	Nov. 18, 1899	Dec. 30, 1899	When notices shall be given to the contractor.	Six months after notice to commence has been given.

The entire work to be completed for an amount of \$114,000.

Notice to commence had not been given and no work had been done up to June 30, 1903.

### *For dredging to enlarge the bed of Bayou Plaquemine from the railroad bridge to deep water below Dardennes Bend.*

Name and address of contractor.	Dated.	Approved.	Date of beginning.	Date of expiration.
Chas. Clarke & Co., Galveston, Tex.	July 15, 1899	Sept. 13, 1899	Nov. 12, 1899	June 30, 1901; extended to June 30, 1902; time limit waived.

About 1,027,509 cubic yards of material to be removed; contract price, 13.98 cents per cubic yard; total amount about \$143,645.76.

A total of 402,630 cubic yards of material had been removed up to June 30, 1903.

### *For construction of protection levee at Plaquemine Lock.*

Name and address of contractor.	Dated.	Approved.	Completed.	Work.
John Short St. Charles, Mo.	Apr. 23, 1902	May 5, 1902	July, 1902	Placing about 18,000 cubic yards earth in constructing levee and filling behind lock wall at 27 cents per cubic yard.

### *For dredging Flat Lake and Bay Natchez, Grand River, Louisiana.*

Name and address of contractor.	Dated.	Approved.	Date of beginning.	Date of expiration.
Chas. Clarke & Co., Galveston, Tex.	Apr. 3, 1902	May 1, 1902	July 5, 1902	July 5, 1903; time limit waived.

For removing not exceeding 377,000 cubic yards of material; contract price, 20 cents per cubic yard.

A total of 282,122 cubic yards of material had been excavated up to June 30, 1903.

## COMMERCIAL STATISTICS, FROM JANUARY 1, 1902, TO DECEMBER 31, 1902.

### *Vessels entering and departing.*

Number .....	155
Net registered tonnage.....	3,600
Draft of heaviest vessel:	
Light .....	5 feet..
Loaded .....	8 do...

**APPENDIX U—REPORT OF LIEUT. COL. H. M. ADAMS. 1293**

*Shipments and receipts by water.*

Articles.	Tons.	Value.
<b>SHIPMENTS.</b>		
Merchandise.....	70,000	\$1,650,000
Sugar cane.....	40,000	160,000
Total.....	110,000	1,810,000
<b>RECEIPTS.</b>		
Fish, oysters, fur, and produce.....	12,000	500,000
Coal and fuel.....	40,000	180,000
Logs.....	130,000	1,820,000
Total.....	182,000	2,500,000
Grand total.....	292,000	4,310,000

NOTE.—At present no vessels are engaged in regular trade on Bayou Plaquemine. The principal part of the freight is handled in small flats. There is no way of determining the tonnage or of number of trips made by each.

REPORT OF MR. J. I. CONKLIN, ASSISTANT ENGINEER.

PLAQUEMINE, LA., July 1, 1903.

SIR: I have the honor to submit the following report of the work under appropriations for improving Bayou Plaquemine and Grand River, Louisiana, in charge of this office, for the fiscal year ending June 30, 1903:

**CONTRACTS IN FORCE DURING YEAR ENDING JUNE 30, 1903.**

*Stewart & Co.*—Building lock and excavating approaches.

*Otis Elevator Company.*—Constructing power house and operating machinery.

*Charles Clarke & Co.*—Widening and deepening Bayou Plaquemine between railroad bridge at Plaquemine and Dardennes bend, a distance of 5.08 miles. Excavating a 50-foot channel, 10 feet deep, with perpendicular sides, in Flat Lake and Bay Natchez, Louisiana, respectively, 1.9 and 7 miles in length.

*John Short.*—Building a protection levee from the northwest corner of Plaquemine lock to the present levee in front of lock.

*Plaquemine lock.*—Up to June 30, 1901, there had been accomplished by Stewart & Co. the following work:

Excavation.....	cubic yards..	29,833
Concrete.....	do.....	80,832
Granite.....	cubic feet..	6,072
Cast iron.....	pounds..	129,198
Medium steel.....	do.....	5,900
High steel:		
Cast.....	do.....	32,256
Forged.....	do.....	15,955
Bronze.....	do.....	624

There has been no actual construction under this contract during the last two fiscal years. The contractor has removed from the works nearly all the plant used in carrying on the contract. There still remain to complete the Plaquemine lock the excavation between the lock and railroad bridge, the fill behind the lock walls, the erection of the gates, the excavation and construction of the approaches, and the construction of the power house and installation of the operating machinery.

In view of the fact that it would probably be necessary, preparations were made to relet that portion of the work covered by the contract with Stewart & Co. not completed, together with that portion of the work not already contracted for, and to make for the completion of the work two separate contracts, one to include the gates, ironwork, and necessary work on miter sills, and the other to include the excavation of the two end approaches, the back fill behind the lock walls, and the construction of the two approaches.

There has been no pumping plant maintained during the year, and the lock chamber is now filled with water to a depth of 16 feet.

There has been no additional cracking of lock walls, and no apparent settlement.

*Bank protection.*—There is submitted with this report a blue print<sup>a</sup> showing the

<sup>a</sup> Not forwarded.

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position of the old mattress work along the river in the front of the lock, the soundings from survey of 1903, and contours from surveys of 1901 and 1903, dotted and full lines, respectively.

The comment to be made in the comparison of these contours is that the effect of the high water of 1903 along the area covered by this survey was:

First. To cause a deposit of from 5 to 10 feet over a large portion of the mattresses placed in 1901-2.

Second. To erode and cut away the bank covered by Dike No. 3, placed in 1895 on section "U" line (1)-(2), from 20 to 30 feet.

Third. To cut out the bank below No. 4 and above Dike No. 5. I regard the most critical conditions to be met, with reference to the Plaquemine lock, are those existing about the position of Dike No. 3, and would recommend that a 600-foot by 400-foot mattress be placed in the river, reaching from section "W" to section "Q," line (1)-(2). Estimated cost, \$35,000.

*Dredging in Bayou Plaquemine.*—There is included in the contract for the rectification of Bayou Plaquemine 1,027,500 cubic yards of excavation. Up to July 1, 1901, there had been taken out 364,230 cubic yards. There has been no work done under this contract during the fiscal year ending June 30, 1903.

*Dredging in Grand River.*—A contract was entered into with Charles Clarke & Co. on April 3, 1902, to excavate a channel 50 feet wide and 10 feet deep, with perpendicular sides, in Flat Lake and Bay Natchez, Louisiana, respectively, 1.9 and 7 miles in length. Approximate amount of excavation, 377,000 cubic yards.

Work was commenced under this contract on July 5, 1902, in Flat Lake. Permission was given the contractor to deposit the excavation from the cut in Flat Lake in the deep water of Berwick Bay, dump scows being used to carry on the work. Buoys were set, marking the limits of the dumping grounds, and the excavation was deposited in from 70 to 90 feet of water. On account of the shallow water adjacent to the cut the contractors found it necessary to excavate a scow channel 35 feet wide and 7 feet deep, which was in reality an enlargement of the main channel. All the material excavated from this scow channel was also deposited in the deep water of Berwick Bay.

The work in Flat Lake was very difficult on account of stumps, which were usually encountered about 4 feet above the bottom of the cut. The channel in the lake was completed January 30, 1903.

Work was started in Bay Natchez on August 7, 1902, with the suction dredge *Arthur* at the upper end of the cut. Work on this end of the cut was comparatively easy, very few stumps being encountered until a point was reached near the mouth of Lake Natchez, where it was found that the dredge *Arthur* would be unable to do the work alone. The larger suction dredge, No. 7, was then brought to the bay and a dipper dredge sent ahead to loosen and blast the stumps. This was only a partial success, and the dredge No. 7 was sent to the lower end of the work and found it practicable to operate between station 8 and section "E," line (9)-(10), a distance of 8,000 feet, when, upon encountering large stumps, the dredge was removed from the work.

At this time the freshets from the Mississippi River raised the water in Bay Natchez so as to admit of using dump scows to take the excavation the required distance from the cut, and work was resumed with a dipper dredge at the point where the suction dredge stopped at the mouth of Lake Natchez. The water had fallen on June 1 so that dump scows could no longer be used, and actual dredging was stopped. The work done by the dipper dredge during May, 1903, could not be estimated, as, contrary to the contract, a combing was left on each side of the channel.

At the present time the contractor is constructing a plant to resume the work during the low stage of water.

The following is a tabulated statement of the work accomplished during the year:

	Cubic yards.
July, 1902 .....	21, 100
August, 1902 .....	33, 660
September, 1902 .....	20, 300
October, 1902 .....	19, 330
November, 1902 .....	29, 681
December, 1902 .....	30, 430
January, 1903 .....	19, 340
February, 1903 .....	3, 276
March, 1903 .....	31, 670
April, 1903 .....	73, 346
Total .....	282, 123

*Marking channel in Flat Lake and Bay Natchez.*—In order to guide the shipping interests using these waters, an agreement was made with Gus Drews to drive 15 piles in Flat Lake and 67 piles in Bay Natchez to mark the channel. Piles were driven in clusters of three at all turns in the channel, and single intermediate piles where necessary.

The piles are all in place in Bay Natchez, but those in Flat Lake have been run into by steamers with rafts of logs and knocked out.

*Protection levee.*—A contract was made with John Short for building a protection levee from the northeast corner of the lock to connect with the main levee system in front of the lock.

Up to July 1, 1902, there had been placed 6,000 cubic yards. The remaining 11,457 cubic yards were placed during July, 1902.

The levee forms part of the approach in front of the lock, and was constructed from earth excavated from the lock pit and wasted on the bank.

Very respectfully, your obedient servant,

J. I. CONKLIN, *Assistant Engineer.*

Lieut. Col. H. M. ADAMS,  
*Corps of Engineers.*

## U 8.

### IMPROVEMENT OF BAYOU COURTABLEAU, LOUISIANA.

No work was done during the past fiscal year, as the funds available would not permit.

This work was dropped from my list of duties January 17, 1903, as authorized.

#### *Money statement.*

July 1, 1902, balance unexpended .....	\$132.54
July 1, 1903, balance available (in Treasury) .....	132.54

#### ABSTRACT OF APPROPRIATIONS.

By act of Congress—	By act of Congress—
Approved June 14, 1880..... \$7,500	Passed August 18, 1894..... \$5,000
Approved March 3, 1881..... 7,500	Passed June 3, 1896..... 2,500
Approved July 5, 1884..... 4,000	Approved March 3, 1899..... 20,000
Approved August 5, 1886..... 5,000	
Passed August 11, 1888..... 5,000	Total ..... 58,700
Approved September 19, 1890. 2,200	

## U 9.

### IMPROVEMENT OF BAYOU TECHE, LOUISIANA.

A history of the progress of the work will be found in the Annual Report of the Chief of Engineers for 1896, pages 1503 and 1504; see also annual report for 1897, page 1764, and annual report for 1900, page 2260.

During the past fiscal year the work of dredging and removal of obstructions has been carried on under contract with the J. H. Gardner Construction Company, dated October 28, 1902. The dredge was furnished for \$79.75 per day of 16 hours. Work was commenced on November 13, 1902, and discontinued on March 13, 1903, the amount



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available for dredging having been expended. The operations of the dredge extended from Vida Pontoon Bridge to St. Martinville, a distance of about 15 miles. For a distance of a little more than 3 miles from Vida Pontoon Bridge a channel 50 to 60 feet wide and 5 feet deep at mean low water was secured; thence to St. Martinville a channel 30 feet wide and with a least depth of 4½ feet was obtained. The turning basin at St. Martinville was also improved, so as to leave a least depth of 5 feet at low water. A total of 56,513 cubic yards of material was dredged and 2 wrecks, 50 logs, and 434 snags were removed from the channel. The dredge was employed 81½ days of 16 hours each.

Bayou Teche is an important commercial stream of southern Louisiana, and is the waterway for shipping for the numerous sugar, rice, and cotton plantations located along its banks. With the exception of snags, the channel is in a fairly good condition below New Iberia, but of late years it has shoaled considerably between New Iberia and St. Martinville, and is not navigable above the latter point except during high-water stages. The improvement of channel accomplished during the past season will not be a permanent one, as sunken logs and fallen trees are constantly forming obstructions which will require removal and the large drainage ditches emptying into the bayou form shoals at their mouths.

It is believed that \$10,000 can be advantageously expended during the ensuing fiscal year in dredging and removing obstructions from the channel.

*Money statement.*

July 1, 1902, balance unexpended .....	\$7, 641.72
June 30, 1903, amount expended during fiscal year .....	7, 615.54
July 1, 1903, balance unexpended .....	26.18
July 1, 1903, outstanding liabilities .....	1.08
July 1, 1903, balance available .....	25.10
{ Amount that can be profitably expended in fiscal year ending June 30, 1905, for maintenance of improvement, in addition to the balance unexpended July 1, 1903 .....	
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	
	10, 000.00

ABSTRACT OF APPROPRIATIONS.

By act of Congress—		By act of Congress—	
Approved July 11, 1870....	\$17, 500	Passed June 3, 1896.....	\$10, 000
Approved June 14, 1880....	6, 000	Approved March 3, 1899....	10, 000
Approved March 3, 1881....	20, 000	Approved June 12, 1902	
Approved July 5, 1884.....	6, 500	(maintenance) .....	7, 500
Approved September 19, 1890.....	5, 000	Total .....	88, 500
Passed August 18, 1894.....	6, 000		

# APPENDIX U—REPORT OF LIEUT. COL. H. M. ADAMS. 1297

## ABSTRACT OF CONTRACTS IN FORCE DURING YEAR ENDING JUNE 30, 1903.

### *For dredging and removing obstructions.*

Name and address of contractor: J. H. Gardner Construction Company, New Orleans, La.

Work: Operating dredge and snag boat, at \$79.75 per day of 16 hours.

Dated: October 28, 1902.

Approved: November 11, 1902.

Date of beginning: November 13, 1902.

Date of completion: March 13, 1903.

## COMMERCIAL STATISTICS FROM JANUARY 1, 1902, TO DECEMBER 31, 1902.

### *Vessels entering and departing.*

	Number.	Trips.	Net registered tonnage.
Steamers .....	41	1,639	119,582
Sailing vessels.....	15	360	1,800
Barges.....	82	3,136	404,476
Total .....	138	5,135	525,808

Draft of heaviest vessel: Light, 2 feet; loaded, 7 feet.

### *Shipments and receipts by water.*

Articles.	Tons.	Value.
<b>SHIPMENTS.</b>		
Lumber.....	17,433	\$253,141
Molasses.....	12,287	491,480
Cotton.....	440	38,660
Cotton-seed products.....	5,293	90,816
Rice.....	7,555	339,975
Sugar.....	43,480	3,043,600
Sugar cane.....	66,701	233,453
Brick.....	4,382	12,440
Total.....	157,571	4,503,565
<b>RECEIPTS.</b>		
Machinery.....	1,887	171,700
Lumber.....	167,934	666,033
Fuel oil.....	51,867	207,468
Fertilizer.....	2,925	53,500
Coal.....	9,000	40,950
Cooperage.....	3,240	53,460
Merchandise.....	14,030	938,765
Total.....	250,883	2,131,876
Grand total.....	408,454	6,635,441



## APPENDIX V.

### IMPROVEMENT OF HOMOCHITTO RIVER, MISSISSIPPI, AND OF CERTAIN RIVERS AND HARBORS IN SOUTHERN LOUISIANA AND EASTERN TEXAS.

REPORT OF CAPT. CHARLES S. BROMWELL, CORPS OF ENGINEERS,  
OFFICER IN CHARGE, FOR THE FISCAL YEAR ENDING JUNE 30,  
1903, WITH OTHER DOCUMENTS RELATING TO THE WORKS.

#### IMPROVEMENTS.

- |  |  |
|--|--|
| 1. Homochitto River, Mississippi.  | 4. Mouth and passes of Calcasieu River, Louisiana. |
| 2. Bogue Chitto, Chefuncte River and Bogue Falia, Tickfaw River and tributaries, and Amite River and Bayou Manchac, Louisiana. | 5. Johnsons Bayou, Louisiana.                      |
| 3. Channel, bay, and passes of Bayou Vermilion and Mermentau River and tributaries, Louisiana.                                 | 6. Removing water hyacinths from Louisiana waters. |
|  | 7. Mouths of Sabine and Neches rivers, Texas.      |
|  | 8. Sabine River, Texas.                            |
|  | 9. Harbor at Sabine Pass, Texas.                   |

UNITED STATES ENGINEER OFFICE,  
*New Orleans, La., June 30, 1903.*

GENERAL: I have the honor to submit herewith my annual report of operations for river and harbor improvement in the Gulf Division under my charge for the fiscal year ending June 30, 1903.

Very respectfully, your obedient servant,

CHAS. S. BROMWELL,  
*Captain, Corps of Engineers.*

Brig. Gen. G. L. GILLESPIE,  
*Chief of Engineers, U. S. A.*

#### V I.

##### IMPROVEMENT OF HOMOCHITTO RIVER, MISSISSIPPI.

For original project for this work see Annual Report Chief of Engineers for 1899, page 1862.

The present project, approved July 17, 1902, provides for the maintenance of the improvement by the removal of obstructions from the mouth of the river to a point 14 miles above.

Work was commenced September 4, 1902, at the "Narrows," about 14 miles from the mouth of the river, and was continued without interruption until January 12, 1903, at which time it became necessary to suspend operations owing to the high stage of water in the river.

## 1300 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

At the date of suspension of the work there had been removed from the bed of the river 727 obstructions (snags, logs, etc.) and 499 overhanging trees had been felled from the banks, in which work 977 pounds of dynamite had been expended.

The river is now perfectly clear of obstructions to navigation for a distance of  $3\frac{1}{4}$  miles from its mouth; for a farther distance of  $21\frac{1}{4}$  miles it is open to navigation, but only partially cleared of obstructions, and for the remaining 35 miles covered by the project of 1899, no work at all has been done.

### *Money statement.*

July 1, 1902, balance unexpended .....	\$2,521. 60
June 30, 1903, amount expended during fiscal year .....	2,091. 50
July 1, 1903, balance available .....	430. 10
<hr/>	
{ Amount that can be profitably expended during the fiscal year ending June 30, 1905, for maintenance of improvement in addition to the balance unexpended July 1, 1903.....	2,000. 00
{ Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

### ABSTRACT OF APPROPRIATIONS.

By act of Congress, approved March 3, 1899 .....	\$16,000
By act of Congress, approved June 13, 1902 (maintenance) .....	2,000

### COMMERCIAL STATISTICS.

No detailed commercial statistics have been obtainable covering the period of this report, but it has been ascertained that about 500,000 feet of lumber and 1,600 tons of miscellaneous merchandise has been transported over this river, the value of which is estimated to be about \$35,000.

## V 2.

IMPROVEMENT OF BOGUE CHITTO, CHEFUNCTE RIVER, BOGUE FALIA, TICKFAW RIVER AND TRIBUTARIES, AMITE RIVER, AND BAYOU MANCHAC. LOUISIANA.

### (a) BOGUE CHITTO.

The original project for this work, approved October 6, 1890, provided for the closing of the west mouth of the river and the removal of snags, logs, and overhanging trees, and fish traps from the other mouth to Alford's bridge, near Summit, Miss., a distance of 190 miles, so as to render the stream navigable for small craft of 3 feet during the greater portion of the year.

For original condition of the river, previous projects, and work accomplished, prior to 1902, see Annual Reports of the Chief of Engineers for 1891, page 1800; 1892, page 1466; 1897, page 1703; 1899, page 1729; and 1900, page 2222.

The work of removing snags, logs, overhanging trees, and other obstructions to navigation, in accordance with the project (for maintenance) approved July 31, 1902, was commenced September 17, 1902, at a point 3 miles above Franklinton, La. (84 miles from the mouth of the river), and carried downstream a distance of 40 miles; 6,212 overhanging trees were felled and taken from the banks of the stream, and 1,019 obstructions (snags, logs, etc.) were removed from its bed, which work required the use of 1,268 pounds of dynamite.

The stream is now navigable for a distance of 84 miles from its mouth.

*Money statement.*

July 1, 1902, balance unexpended.....	\$3,000.00
June 30, 1903, amount expended during fiscal year.....	2,676.66
July 1, 1903, balance unexpended.....	323.34
Amount (estimated) required for completion of existing project.....	30,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903:	
For works of improvement.....	\$10,000.00
For maintenance of improvement.....	3,000.00
	13,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

ABSTRACT OF APPROPRIATIONS.

By act of Congress—	By act of Congress—
Approved September 19, 1890 \$5,000	Approved June 13, 1902 (allotted).....
Approved July 13, 1892..... 5,000	
Of August 18, 1894..... 5,000	Total.....
Passed June 3, 1896..... 5,000	28,000
Approved March 3, 1899..... 5,000	

COMMERCIAL STATISTICS.

No commercial statistics could be obtained, but it is believed that the traffic over this stream consists principally of the rafting of timber (logs, etc.) for the sawmills bordering thereon.

(b) CHEFUNCTE RIVER AND BOGUE FALIA.

For previous projects for this work see Annual Reports of Chief of Engineers for 1873, page 634; 1880, page 1182; 1884, page 1270; 1889, page 1530; 1893, page 1808; 1895, page 1742; and 1899, page 1834.

The present project provides for dredging a channel 60 feet wide and 6 feet deep across the bar at the mouth of the Chefuncte River, the work to be done under contract. A modification of this project, submitted to the Chief of Engineers December 23, 1902, and by him approved December 26, 1902, provides for dredging a channel 6 feet deep, measured at extreme low water, and as wide as funds available would permit.

Under date of October 15, 1902, a contract, approved November 4, 1902, was made with the Jahnce Navigation and Improvement Com-

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pany, of New Orleans, La., for dredging a channel through the bar at the entrance to the Chefuncte River for 17½ cents per cubic yard. It was estimated that it would require the removal of approximately 15,000 cubic yards of material to secure a channel 60 feet wide and of the required depth.

Work under this contract was begun December 24, 1902, and the channel completed January 31, 1903; 10,357 cubic yards of material were removed at a cost of \$1,812.57. A navigable channel 130 feet in width, with a depth of 6.8 feet at extreme low water, was secured.

Under authority of the Chief of Engineers, dated February 24, 1903, the available balance to the credit of this appropriation (\$1,194.01) was transferred to the work of "Improving Amite River and Bayou Manchac, Louisiana."

As snags and logs will continue to accumulate and bars form in the channel at the mouth of the river, the maintenance of navigation will require the periodical removal of these obstructions at an estimated cost of \$3,000 annually.

## Money statement.

July 1, 1902, balance unexpended .....	\$3, 030. 73
February 24, 1903, transferred to "Improving Amite River and Bayou Manchac, Louisiana," authority from the Chief of Engineers.....	1, 194. 01
	<hr/>
	1, 836. 72
June 30, 1903, amount expended during fiscal year .....	<hr/>
	1, 836. 72
<hr/>	
{ Amount that can be profitably expended during the fiscal year ending June 30, 1905, for maintenance of improvement.....	3, 000. 00
{ Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of river and harbor act of 1899.	

## ABSTRACT OF APPROPRIATIONS.

By act of Congress—		By act of Congress—	
Approved March 3, 1881 .....	\$1, 500	Passed June 3, 1896 (maintenance) .....	\$1, 000
Passed August 2, 1882.....	1, 500	Approved March 3, 1899 (maintenance) .....	1, 000
Approved August 5, 1886.....	2, 500	Approved June 13, 1902 (maintenance) .....	3, 000
Approved September 19, 1890 .....	1, 000		
Approved July 13, 1892 (maintenance) .....	1, 000		
Of August 18, 1894 (maintenance) .....	1, 000	Total .....	13, 500

## COMMERCIAL STATISTICS FROM JANUARY 1, 1902, TO DECEMBER 31, 1902.

### Vessels entering and departing.

Class.	Number.	Trips.	Net registered tonnage.
Steamers .....	6	72	79
Sailing vessels.....	30	506	706
Barges.....	9	192	672
Total .....	45	770	1, 457

*Shipments and receipts by water.*

Articles.	Tons.	Value.
<b>SHIPMENTS.</b>		
Sand, brick, and fire clay.....	68,282	\$15,378
Lumber.....	27,841	164,046
Wood (fuel).....	927	3,245
Rosin, turpentine, and tar.....	3,337	32,363
Charcoal.....	66	1,540
Junk and old iron.....	231	4,620
Hides.....	3	340
Cotton.....	390	93,600
Cotton seed.....	19	1,852
Miscellaneous.....	222	21,022
Total.....	100,768	338,006

NOTE.—The above covers only that portion of the business done between the Chefuncte River and New Orleans. Statistics covering that portion of the business with Slidell, Ship Island, Gulfport and other adjacent points could not be obtained.

*(c) TICKFAW RIVER AND TRIBUTARIES, LOUISIANA.*

For previous projects for this work, see Annual Reports Chief of Engineers for 1880, page 1184; 1892, page 1484; 1893, page 1811; 1897, page 1753; and 1899, page 1835.

The present project, approved July 31, 1902, provides for a continuation of maintenance by the removal of obstructions (snags, logs, etc.) from the mouth of the Tickfaw River to the mouth of the Natalbany River; from the Natalbany River, from its mouth, to the mouth of the Pontchatoula River; and from the Pontchatoula River, from its mouth, to Wadesboro, La., or as far as available funds would permit, the work to be done by the hire of suitable snagging plant.

A contract for hire of a boat and suitable plant for removing obstructions from these rivers, for \$70 per day of eight hours each until the sum of \$840 had been earned, was entered into with the Jahnce Navigation and Improvement Company of New Orleans, La., October 8, 1902, which contract was approved by the Chief of Engineers November 18, 1902.

Work under this contract was commenced November 10, 1902, and the entire contract completed November 22, 1902, during which period the contractor removed 9 obstructions from the Tickfaw River, 39 from the Natalbany River, and 26 from the Pontchatoula River.

The work accomplished was greatly retarded by the presence, in large quantities, of water hyacinths, which required considerable time for their removal in order that the boat could proceed.

The Tickfaw and Natalbany rivers are believed to have ample depth for the accommodation of the class of craft navigating these streams, and they are now free from such obstructions as snags, logs, etc., on the stretch recently cleared. But the water hyacinths usually collect in large quantities in these streams and in the Pontchatoula River, which is also free from obstructions for a distance of  $3\frac{1}{2}$  miles from its mouth, and these plants serve to impede free navigation of these streams.

It is also believed that some few obstructions still exist in the Pontchatoula River, within a distance of  $1\frac{1}{2}$  miles from the limit of the area cleared, and from that point to Wadesboro, La., this river is entirely blocked with water hyacinths.



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Nothing further could be done toward the improvement of navigation in these rivers, the balance of funds available for expenditure being too small to admit of being expended to advantage.

## Money statement.

July 1, 1902, balance unexpended .....	\$1,010. 19
June 30, 1903, amount expended during fiscal year .....	930. 75
July 1, 1903, balance available.....	79. 44
<hr/>	
{ Amount that can be profitably expended in fiscal year ending June 30, 1905, for maintenance of improvement, in addition to the balance unexpended July 1, 1903.....	1,000. 00
{ Submitted in compliance with the requirements of sundry civil act of June 4, 1897, and of section 7 of river and harbor act of 1899	

## ABSTRACT OF APPROPRIATIONS.

### By act of Congress—

Approved March 3, 1881 .....	\$2,000
Passed August 2, 1882 .....	2,000
Approved August 5, 1886.....	2,000
Of August 11, 1888 .....	1,000
Approved September 19, 1890 .....	1,000
Approved July 13, 1892 (maintenance).....	1,000
Passed August 18, 1894 (maintenance).....	1,000
Passed June 3, 1896 (maintenance) .....	1,000
Approved March 3, 1899 (maintenance) .....	1,000
Approved June 13, 1902 (maintenance) .....	<sup>a</sup> 1,000
Total .....	13,000

## COMMERCIAL STATISTICS FROM JANUARY 1, 1902, TO DECEMBER 31, 1902.

### Vessels entering and departing.

Class.	Number.	Trips.	Net registered tonnage.
Steamers .....	8	141	179
Sailing vessels.....	12	164	143
Barges.....	2	56	100
Total .....	22	361	422

Draft of heaviest vessel: Light, 7 feet; loaded, 8 feet.

### Shipments and receipts by water.

Articles.	Tons.	Value.
<b>SHIPMENTS.</b>		
Lumber .....	21,968	\$142,792
Staves.....	37	7,260
Wool.....	5	2,500
Hides.....	1	140
Logs.....	23,600	56,900
Cotton .....	21	5,040
Total.....	45,632	214,632

NOTE.—The above only covers that portion of the business done between Tickfaw River and New Orleans. Statistics covering the business between this river and Slidell, Ship Island, Gulfport, and other adjacent points could not be obtained.

<sup>a</sup> Allotted.

## (d) AMITE RIVER AND BAYOU MANCHAC, LOUISIANA.

For previous projects for this work see Annual Reports Chief of Engineers for 1880, page 1157; 1883, page 1105; 1884, page 1263; 1889, page 1529; 1891, page 1821; 1892, page 1486; 1893, page 1813; and 1899, page 1837.

The present project (for maintenance), approved July 31, 1902, provides for redredging a channel 8 feet deep and of such width (estimated at 50 feet) as funds available would permit, through the bar at the mouth of the Amite River, the work to be done under contract.

A contract for this dredging, approved by the Chief of Engineers, November 4, 1902, was entered into with the Jahncke Navigation and Improvement Company of New Orleans, La., for 17½ cents per cubic yard. Work under this contract was commenced February 4, 1903, and the entire channel completed March 9, 1903.

The completed channel measures 50 feet in width and 3,400 feet in length, extending eastward to Pass Manchac from a point about 1,200 feet from the United States light-house at the mouth of the river. It has a depth at extreme low water of 8 feet for a distance of 1,630 feet next the mouth of the Amite River and a depth of 6 feet at extreme low water for the remaining 1,770 feet of its length; 20,648 cubic yards of material were removed, at a cost of \$3,292.56. The channel secured is considered amply sufficient for the present requirements of navigation on this stream.

No work toward the removal of logs, snags, etc., that have accumulated in this river and Bayou Manchac has been done during the past fiscal year, for the reason that the available funds were not sufficient to carry on such work in addition to the dredging required at the mouth of the Amite River.

It is estimated that \$2,500 will be annually required to maintain the existing improvement.

*Money statement.*

July 1, 1902, balance unexpended .....	\$2, 612. 37
February 24, 1903, amount transferred from "Improving Chefuncte River and Bogue Falia, Louisiana," under authority from the Chief of Engineers, U. S. Army .....	1, 194. 01
March 1, 1903, amount available for expenditure .....	3, 806. 38
June 30, 1903, amount expended during fiscal year .....	3, 672. 72
July 1, 1903, balance available .....	133. 66
{ Amount that can be profitably expended during the fiscal year ending June 30, 1905, for maintenance of improvement, in addition to balance unexpended July 1, 1903.....	
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of river and harbor act of 1899.	2, 500. 00

## ABSTRACT OF APPROPRIATIONS.

By act of Congress—		By act of Congress—	
Approved June 14, 1880.....	\$8, 000	Passed June 3, 1895 (for maintenance) .....	\$2, 500
Approved March 3, 1881.....	5, 000	Approved March 3, 1899 (for maintenance) .....	2, 500
Approved August 5, 1886.....	2, 000	Approved June 13, 1902 (for maintenance) .....	2, 500
Of August 11, 1888.....	5, 000	Total .....	36, 300
Approved September 19, 1890	3, 800		
Approved July 13, 1892			
(\$1,500 for maintenance) ..	2, 500		
Of August 18, 1894 (for maintenance) .....	2, 500		

# 1306 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

COMMERCIAL STATISTICS FROM JANUARY 1, 1902, TO DECEMBER 31, 1902.

## *Vessels entering and departing.*

Class.	Number.	Trips.	Net registered tonnage.
Steamers .....	9	167	350
Sailing vessels .....	22	262	286
Barges .....	1	2	41
Total .....	32	431	677

Draft of heaviest vessel: Light, 7 feet; loaded, 8 feet.

## *Shipments and receipts by water.*

Articles.	Tons.	Value.
<b>SHIPMENTS.</b>		
Lumber .....	1,878	\$11,388
Shingles, laths, and staves .....	1,288	23,650
Logs .....	34,400	79,120
Wood (fuel) .....	2,672	10,688
Hides and furs .....	4	6,750
Cotton and cotton seed .....	3,247	254,916
Bricks .....	1,159	3,311
Miscellaneous .....	52	1,275
Total .....	44,694	391,098

NOTE.—The above only covers that portion of the business between the Amite River and New Orleans. Statistics covering the portion done between this stream and Slidell, Ship Island, Gulfport, and adjacent points could not be obtained.

## V 3.

### IMPROVEMENT OF CHANNEL, BAY, AND PASSES OF BAYOU VERMILION AND MERMENTAU RIVER AND TRIBUTARIES, LOUISIANA.

#### (a) CHANNEL, BAY, AND PASSES OF BAYOU VERMILION, LOUISIANA.

For previous projects for this work and results accomplished, see Annual Reports of Chief of Engineers for 1880, pages 1157-1165; 1883, page 1107; 1887, page 1398; 1891, page 1856; 1893, page 1826; 1895, page 1766; and 1899, page 1850. Project for maintenance (1892) was approved by the Secretary of War August 12, 1892.

The present project, approved July 12, 1902, provides for the maintenance of the improvement by the removal of obstructions (snags, logs, etc.) from the bayou from its mouth to the Southern Pacific Railroad bridge, or as far as available funds would permit, the work to be done by the hire of suitable snagging plant.

A contract, approved by the Chief of Engineers October 30, 1902, was entered into October 25, 1902, with Mr. Victor Von Schoeler, of Franklin, La., for the hire of a snag boat for \$32.25 per day. A second contract was entered into June 6, 1903, with the same party for the hire of a snag boat for \$27.40 per day.

Work under these contracts was commenced November 4, 1902, near O'Lidons Ferry, 18 miles above Abbeville, La., and on June 30, 1903, there had been 838 obstructions (snags, logs, etc.) and 574 over-

hanging trees removed for a distance of 20 miles from the starting point. The bayou is now navigable for vessels drawing 6 feet of water or less, for a distance of 45 miles from its mouth, there being a cleared channel of about 60 feet width, averaging from 4 to 12 feet deep.

This improvement, however, is not considered permanent, and it is estimated that \$2,000 will annually be required for the maintenance of navigation over this stream.

*Money statement.*

July 1, 1902, balance unexpended.....	\$9,000.00
June 30, 1903, amount expended during fiscal year.....	4,725.97
July 1, 1903, balance unexpended.....	4,274.03
July 1, 1903, outstanding liabilities.....	3,500.00
July 1, 1903, balance available.....	774.03
Amount that can be profitably expended during fiscal year ending June 30, 1905, for maintenance of improvement, in addition to the balance unexpended July 1, 1903.....	
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	
	2,000.00

ABSTRACT OF APPROPRIATIONS.

By act of Congress—		By act of Congress—	
Approved July 13, 1892.....	\$7,500	Approved June 13, 1902 (al-	
Passed August 18, 1894.....	5,000	lotted).....	\$9,000
Passed June 3, 1896.....	1,000	Total.....	25,000
Approved March 3, 1899.....	2,500		

COMMERCIAL STATISTICS FROM JANUARY 1, 1902, TO DECEMBER 31, 1902.

*Vessels entering and departing.*

Class.	Number.	Trips.	Net registered tonnage.
Steamers.....	5	300	12,000
Sailing vessels.....	10	200	1,000
Barges.....	8	300	24,000
Total.....	23	800	37,000

Draft of heaviest vessel: Light, 4 feet; loaded, 5 feet.

*Shipments and receipts by water.*

Articles.	Tons.	Value.	Articles.	Tons.	Value.
SHIPMENTS.			RECEIPTS.		
Cotton.....	2,025	\$128,250	Lumber.....	1,150	\$12,800
Sugar and molasses.....	250	15,000	Machinery.....	1,000	100,000
Sugar cane.....	10,000	32,000	Fuel oil.....	2,885	15,000
Rice.....	2,000	80,000			
Cattle.....	500	20,000			
Total.....	14,775	275,250	Total.....	5,035	127,800
Grand total.....				19,810	403,550

# 1308 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

## *Abstract of contracts in force.*

Name and address of bidder.	Character of work.	Amount involved.
Victor Von Schoeler, Franklin, La.....	Removing snags, logs, and overhanging trees....	\$3,500

### (b) MERMENTAU RIVER AND TRIBUTARIES, LOUISIANA.

For previous projects and results accomplished on this work see Annual Reports Chief of Engineers 1897, page 1767, and 1900, page 2264 (maintenance).

The original project for this work was approved by the Secretary of War August 15, 1892, and provided for the removal of obstructions (snags, overhanging trees, and mud flats), for which the sum of \$23,615 was appropriated during the years 1892, 1894, 1896, and 1899.

The present project, approved July 12, 1902, provides for the expenditure of \$2,500, allotted June 13, 1902, for the maintenance of the improvement under the original project by making the necessary repairs to the brush dams in Mud Lake, by which the current in the Mermentau River would be sufficiently increased in velocity to scour a channel through Mud Lake.

Under date of August 14, 1902, bids for the contemplated repairs to the brush dams in Mud Lake were advertised for, and under authority of the Chief of Engineers, dated September 17, 1902, the only bid received was rejected as being excessive.

John Short, of St. Louis, Mo., under date of March 10, 1903, submitted a bid for these repairs, which, being considered reasonable, was accepted and a contract was entered into March 16, 1903.

An examination of the dams to ascertain the nature and extent of the repairs necessary was made on May 6, 1903, and it was shown that the diminution of the fresh water in Mermentau River, owing to an increased consumption of water for rice irrigation purposes, permitted an increased inflow of salt water from the Gulf, and that the piling of the lower dam had been attacked by the "teredo" and its usefulness almost destroyed. Owing to the existing conditions it was deemed unwise to undertake the repair of the lower dam and operations were therefore confined to the repair of the upper dam.

This work was commenced May 12, 1903, and entirely completed June 2; 150 piles were replaced, 450 strips 2 by 3 inches by 6 feet were nailed in place, and 80,000 linear feet of brush fascine were used in the work of repairs, at a total cost of \$2,801.66, including superintendence and inspection.

### *Money statement.*

July 1, 1902, balance unexpended .....	\$4,043. 22
June 30, 1903, amount expended during fiscal year .....	2,994. 31
July 1, 1903, balance available .....	1,048. 91
Amount that can be profitably expended during the fiscal year ending June 30, 1895, for maintenance of improvement in addition to the balance unexpended July 1, 1903 .....	
Submitted in compliance with the requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	1,500.00

# APPENDIX V—REPORT OF CAPTAIN BROMWELL. 1309

## ABSTRACT OF APPROPRIATIONS.

By act of Congress—		By act of Congress—	
Approved July 13, 1892 ..	\$7,500.00	Approved June 13, 1902	
Passed August 18, 1894...	5,000.00	(allotted) .....	\$2,500.00
Passed June 3, 1896.....	5,000.00		
Approved March 3, 1899..	6,115.25	Total .....	28,115.25

## COMMERCIAL STATISTICS FROM JANUARY 1, 1902, TO DECEMBER 31, 1902.

### Vessels entering and departing.

Class.	Number.	Trips.	Net registered tonnage.
Steamers .....	7	134	5,290
Sailing vessels .....	8	110	2,422
Barges .....	(Small; not registered.)		
Total .....	15	244	7,708

Draft of heaviest vessel: Loaded, 5 feet; light, 2 feet.

### Shipments and receipts by water.

Articles.	Tons.	Value.	Articles.	Tons.	Value.
SHIPMENTS.			RECEIPTS.		
Rice .....	14,000	\$650,000	Merchandise .....	1,250	\$93,750
Cattle .....	1,420	91,000	Machinery .....	826	82,600
Cord wood .....	900	3,150	Lumber .....	3,612	23,478
Hides and furs .....	78	8,000	Fuel oil .....	26,040	130,200
Sand and brick .....	2,200	6,600			
Total .....	18,598	658,750	Total .....	31,728	330,028
Grand total .....				50,326	988,778

## V 4.

### IMPROVEMENT OF MOUTH AND PASSES OF CALCASIEU RIVER, LOUISIANA.

For previous projects for this work and results accomplished see Annual Reports Chief of Engineers for 1871, page 558; 1872, page 61; 1881, pages 1302-1304; 1882, page 1387; 1886, page 1277; 1887, pages 1379-1403, 1404; 1895, page 1772; and 1900, page 2266.

The present project for this work was approved July 3, 1902, and provides for redredging the channel through the inner pass to its original depth of 8 feet, and repairing the revetment built to prevent the return of the dredged material; also the repairs to and extension of the east jetty.

The above project was submitted to cover the expenditure of \$75,000 appropriated June 13, 1902, which, together with an unexpended balance from former appropriations of \$498.87, made the sum of \$75,498.87 available for the work.

# 1310 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

Under date of July 28, 1902, bids were invited for dredging in Calcasieu Lake, Louisiana, and for repairing the jetties, in accordance with the above project. Only two bids for the dredging were received, which being considered excessive, were rejected by the Chief of Engineers.

The bid of John Short, of St. Louis, Mo., for the repairs to and extension of the east jetty was accepted, and a contract, approved by the Chief of Engineers November 15, 1902, was entered into. At date of this report no work had been done on this contract.

A bid from the Bowers Southern Dredging Company of 20 cents per cubic yard for the work of dredging in the channel was accepted under authority of the Chief of Engineers of November 28, 1902.

The appropriation of June 13, 1902 (\$75,000), was divided as follows:

For dredging in the channel.....	\$10,000
For repairs to and extension of east jetty.....	65,000
Total.....	75,000

The contract entered into with the Bowers Southern Dredging Company covered the removal of only 50,000 cubic yards of material from the channel, within a distance estimated at 3,500 feet. As the work accomplished did not satisfy the requirements of navigation, an agreement, sanctioned by the Chief of Engineers, was made with the contractor for the repairs to the jetties, by which the sum of \$5,000 was transferred from the amount set aside for that work and added to that for dredging. An offer of the Bowers Southern Dredging Company to do this additional dredging for 17½ cents per cubic yard was accepted, and the distance of redredged channel was extended 2,770 feet, making the total distance redredged 5,770 feet, with a width of 60 feet and a mean low-water depth of 8 feet.

Upon representations by the navigation interests concerned as to the inadequacy of the results accomplished, a survey of a proposed farther extension of the channel was made, and it was developed that in order to make the completed work effective it would be necessary to extend the redredged channel a farther distance of 4,600 feet into the lake in order to remove all the existing obstructions, such as slabs, piling, rock, etc., washed into the old channel by the rapidly deteriorating revetment.

## Money statement.

July 1, 1902, balance unexpended .....	\$75,498.87
June 30, 1903, amount expended during fiscal year .....	15,212.65
July 1, 1903, balance unexpended.....	60,286.22
July 1, 1903, amount covered by uncompleted contracts .....	60,000.00
(Amount (estimated) required for completion of existing project.....	242,681.00
Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903:	
For works of improvement .....	\$242,681.00
For maintenance of improvement .....	20,000.00
	262,681.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

# APPENDIX V—REPORT OF CAPTAIN BROMWELL. 1311

## ABSTRACT OF APPROPRIATIONS.

By act of Congress—		By act of Congress—	
Approved June 10, 1872....	\$15,000	Approved June 13, 1892....	\$100,000
Approved March 3, 1881....	15,000	Passed August 18, 1894....	90,000
Passed August 2, 1882.....	10,000	Passed June 3, 1896.....	80,000
Approved July 5, 1884.....	6,500	Approved March 3, 1899..	35,000
Of August 11, 1888.....	10,000	Approved June 13, 1902...	75,000
Approved September 19, 1890.....	75,000	Total.....	511,500

## ABSTRACT OF CONTRACTS IN FORCE.

Name and address of contractor.	Character of work.	Amount involved.
John Short, St. Louis, Mo.....	Repairs to and extension of east jetty.....	\$60,000

## COMMERCIAL STATISTICS FROM JANUARY 1, 1902, TO DECEMBER 31, 1902.

### Vessels entering and departing.

Class.	Number.	Trips.	Net registered tonnage.
Steamers.....	9	391	15,623
Sailing vessels.....	22	183	5,762
Barges.....	3	18	1,644
Total.....	34	592	23,010

Draft of heaviest vessel: Light, 6.5 feet; loaded, 8 feet.

### Shipments and receipts by water.

Articles.	Tons.	Value.	Articles.	Tons.	Value.
SHIPMENTS.			RECEIPTS.		
Lumber.....	6,747	\$31,250	Merchandise.....	1,180	\$88,500
Rice.....	1,560	63,375	Logs.....	125,000	550,000
Cotton.....	990	60,650	Machinery.....	50	5,000
Coal and wood.....	1,000	4,000			
Fuel oil.....	1,964	9,770			
Hides and furs.....	2	2,000			
Total.....	12,253	171,045	Total.....	126,230	643,500
Grand total.....				138,483	814,545

## V 5.

### IMPROVEMENT OF JOHNSONS BAYOU, LOUISIANA.

The present project, approved April 10, 1899, and completed December 26, 1899, provided for the dredging of a channel 6 feet deep and of such width as funds available would permit (estimated at 60 feet) from the 6-foot depth in Sabine Lake to the 6-foot depth in Johnsons Bayou, the work to be done under contract.

No work was done during the fiscal year ending June 30, 1903, and none is considered necessary during the ensuing year.



# 1312 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

## *Money statement.*

July 1, 1902, balance unexpended ..... \$238.65  
 July 1, 1903, balance available ..... 238.65

## ABSTRACT OF APPROPRIATIONS.

By act of Congress approved March 3, 1899 ..... \$2,500

## COMMERCIAL STATISTICS FROM JANUARY 1, 1902, TO DECEMBER 31, 1902.

### *Vessels entering and departing.*

Class.	Number.	Trips.	Net registered tonnage.
Steamers .....	1	70	1,050
Sailing vessels .....	6	60	450
Total .....	7	130	1,500

Draft of heaviest vessel: Light, 2 feet; loaded, 4½ feet.

### *Shipments and receipts by water.*

Articles.	Tons.	Value.	Articles.	Tons.	Value.
SHIPMENTS.			RECEIPTS.		
Cotton and cotton seed products .....	252	\$11,340	Merchandise .....	300	\$14,000
Garden truck and fruit .....	602	12,250	Lumber .....	760	4,940
Cattle .....	966	40,150	Miscellaneous .....	40	1,450
Hides and furs .....	4	4,450			
Miscellaneous .....	8	600			
Total .....	1,852	68,790	Total .....	1,100	20,890
Grand total .....				2,952	89,080

## V 6.

### REMOVING THE WATER HYACINTH, LOUISIANA.

The present project for this work was approved May 9, 1899, and provided for the construction of a boat to remove the water hyacinth from the navigable streams of Louisiana, for operation of this boat, and for the construction of log booms to be used as adjuncts to the boat.

This project was modified by the river and harbor act of June 13, 1902, to permit of the extermination of the plant by chemical or other means.

The project, approved by the Secretary of War August 1, 1902, covering the allotments of August 6 and September 26, 1902, together with the unexpended balance from last fiscal year, provided for the destruction of water hyacinths in Bayou Plaquemine, Grand River, Flat Lake, and Bayou Natchez, Louisiana. This project was modified September 26, 1902, to permit of necessary repairs being made to the floating log boom constructed at the mouth of Bayou Teche and its operation for two years.

For work previously accomplished, see Annual Report Chief of Engineers for 1901, page 1906.

The project submitted July 25, 1902, covering the destruction of water hyacinths during the fiscal year ending June 30, 1903, having been approved by the Secretary of War August 19, 1902, the steamer *Ramos*, purchased and equipped with machinery for crushing the hyacinths under the project of 1899, was brought to Plaquemine, La., during September, and the work of installing boiling and cooling tanks, pumps, hose, spray heads, etc., to be used in connection with the Harvesta chemical compound, was completed.

Operations for the destruction of the water hyacinth by spraying with the Harvesta chemical compound were begun September 25, 1902, in Bayou Plaquemine, near Grosse Tete, La., and suspended December 8, 1902. The steamer *Ramos* was laid up for the winter, as it was found that the action of the compound was ineffective during cold weather.

Operations were resumed April 20, 1903, and from that date until May 31, 1903, the *Ramos* was continuously employed in spraying the hyacinths in Bayou Plaquemine, lower Grand River, Bay Natchez, Grosse Tete Bay, Grosse Tete Bayou, and Choctaw Bayou. On June 1 the *Ramos* was tied up, having completed the work for the time being.

Little or no hyacinths were found in Bayou Goddell, Belle River, and Bayou Long, although these latter streams were among those most thickly obstructed last year. A source of great benefit to nearly all the hyacinth-infested streams has been the high stage of water in the Mississippi River this spring, which supplied a good current through the Atchafalaya River, and which was the means of carrying almost all of the hyacinths out to salt water.

Bayous Plaquemine and Grosse Tete, where there is an absence of river current, are the breeding places for the hyacinths which later on obstruct the lower streams. In these bayous they were most effectively destroyed by the chemical compound.

The total waterway from Bayou Plaquemine to Morgan City, La., is at this date (July 1, 1903) cleared of hyacinths, and it is expected that they will remain so cleared for some months to come. The *Ramos* will be put in commission again when the hyacinths form such a dense growth as to interfere with the navigation of the present cleared streams.

The amount of surface sprayed, number of gallons of compound consumed, and the cost of the work is as follows:

## Season 1902-3.

	Gallons of compound consumed.	Approximate square yards surface sprayed.	Cost per square yard compound only.	Cost per square yard sprayed, including fuel, rations, etc.
1902.				
September.....	8,300	150,000	\$.0017	\$.0081
October.....	50,950	556,000	.0027	.0040
November.....	162,800	1,609,000	.0030	.0035
December.....	24,000	237,600	.0030	.0046
1903.				
April.....	33,800	183,656	.0054	.0064
May.....	77,100	949,496	.0024	.0031
Total.....	356,950	3,690,662	a .0029	.0037

a Average cost.

# 1314 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

## REPAIRS TO LOG BOOM AT THE MOUTH OF BAYOU TECHE, LOUISIANA.

On March 12, 1903, an agreement was entered into with J. G. Fuller, of Morgan City, La., for the necessary repairs to the log boom at the mouth of the Bayou Teche, for \$447.50. This work was completed April 14, 1903, and the boom is now in a satisfactory working condition. It is proposed to engage the services of some competent person in its immediate vicinity to attend to its operation as conditions may warrant, in order to facilitate free navigation of the bayou.

### *Money statement.*

July 1, 1901, balance unexpended .....	\$7,484.46
August 6, 1902, amount allotted act June 13, 1902 .....	\$18,000
September 26, 1902, amount allotted act June 13, 1902 .....	1,480
	<hr/> 19,480.00
September 30, 1902, total available for expenditure.....	26,964.46
June 30, 1903, amount expended during fiscal year .....	17,341.09
	<hr/>
July 1, 1903, balance unexpended .....	9,623.37
July 1, 1903, outstanding liabilities.....	720.00
	<hr/>
July 1, 1903, balance available .....	8,903.37
	<hr/>
{ Amount that can be profitably expended during fiscal year ending June 30, 1905, in addition to balance unexpended July 1, 1903.....	20,000.00
{ Submitted in compliance with requirements of sundry civil act of June 4, 1897.	

### ABSTRACT OF APPROPRIATIONS.

By act of Congress approved March 3, 1899 .....	\$36,000
Allotted August 6, 1902.....	18,000
Allotted September 26, 1902.....	1,480
	<hr/>
Total .....	55,480

## V 7.

### IMPROVEMENT OF THE MOUTHS OF SABINE AND NECHES RIVERS, TEXAS.

For previous projects for this work and for improving Neches River, Texas, see Annual Reports of the Chief of Engineers, 1878, page 611; 1879, page 909; 1880, page 1202; 1887, page 1384; 1897, page 1789, and 1900, page 2274.

A project submitted August 14, 1902, and covering the expenditure of \$125,000, appropriated by the Fifty-fourth Congress, second session, provided for securing a channel 8 feet deep at mean low water and 150 feet in width, from the head of Sabine Pass to the Neches River, thence to Sabine River, the work to be done under contract.

Upon recommendation of the Chief of Engineers, dated September 27, 1902, approved by the Secretary of War November 6, 1902, no work will be undertaken under the above project for the present.

*Money statement.*

July 1, 1902, balance unexpended .....	\$125, 074. 71
July 1, 1903, balance unexpended .....	125, 074. 71
Amount (estimated) required for completion of existing project.....	25, 000. 00
Amount that can be profitably expended during fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903:	
For works of improvement.....	\$25, 000
For maintenance .....	4, 000
	29, 000. 00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

ABSTRACT OF APPROPRIATIONS.

By act of Congress approved—	
March 3, 1899.....	\$10, 000
June 13, 1902 .....	125, 000
Total .....	135, 000

COMMERCIAL STATISTICS FROM JANUARY 1, 1902, TO DECEMBER 31, 1902.

*Vessels entering and departing.*

Class.	Number.	Trips.	Net registered tonnage.
Steamers .....	16	308	3, 851
Sailing vessels.....	8	24	310
Barges.....	11	200	26, 510
Total .....	35	532	30, 671

Draft of heaviest vessel: Light, 4½ feet; loaded, 6 feet.

*Shipments and receipts by water.*

Articles.	Tons.	Value.	Articles.	Tons.	Value.
SHIPMENTS.			RECEIPTS.		
Lumber .....	15, 120	\$65, 000	Machinery.....	600	\$60, 000
Merchandise .....	1, 040	70, 000	Logs .....	50, 000	117, 000
Fuel oil .....	13, 343	28, 590	Fresh water.....	1, 625	5, 400
Miscellaneous .....	2, 012	40, 240	Shells and sand.....	62, 000	124, 000
Total .....	31, 515	203, 830	Total.....	114, 225	306, 400
Grand total.....				145, 740	510, 230

V 8.

IMPROVING SABINE RIVER, TEXAS.

For previous projects for this work and results accomplished see Annual Reports of the Chief of Engineers for 1873, page 881; 1879, page 904; 1880, page 1195; 1886, page 1287; 1892, page 1510; 1893, page 1836; 1895, page 1779; 1897, page 1773; 1899, page 1857; and 1900, page 2274.

# 1316 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

The present project for this work, approved July 9, 1899, provided for the removal of the most dangerous obstructions between Morgans and Sudduths bluffs, under contract, which work was completed, as far as funds available would permit, on July 13, 1900, since which date nothing further has been done on account of lack of funds. (See Annual Report of the Chief of Engineers, 1901, p. 1908.)

## Money statement.

July 1, 1902, balance unexpended .....	\$161. 67
July 1, 1903, balance unexpended .....	161. 67

Amount that can be profitably expended during the fiscal year ending June 30, 1905, for maintenance of improvement, in addition to the balance unexpended July 1, 1903.....	1,000. 00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of river and harbor act of 1899.	

## ABSTRACT OF APPROPRIATIONS.

By act of Congress—	By act of Congress—
Approved June 10, 1872 (allotted) .....	Approved March 3, 1899 (maintenance) .....
Approved June 18, 1878 ....	Amount allotted by sundry civil act of March 2, 1895, from appropriation of August 18, 1894, for "improving Sabine Pass, Tex." .....
Approved March 3, 1879 ....	
Approved June 14, 1880 ....	
Approved March 3, 1881 ....	
Passed August 2, 1882 .....	
Approved July 13, 1892 .....	
Passed August 18, 1894 .....	
Passed June 3, 1896 .....	
	Total .....

## COMMERCIAL STATISTICS FROM JANUARY 1, 1902, TO DECEMBER 31, 1902.

### Vessels entering and departing.

Class.	Number.	Trips.	Net registered tonnage.
Steamers .....	8	374	8,582
Sailing vessels .....	8	74	2,969
Barges .....	11	312	54,742
Total .....	27	760	66,298

### Shipments and receipts by water.

Articles.	Tons.	Value.	Articles.	Tons.	Value.
SHIPMENTS.			RECEIPTS.		
Brick and shells .....	3,245	\$9,735	Machinery and steel .....	652	\$65,200
Cattle .....	100	4,000	Fuel oil .....	931	4,655
Lumber .....	40,434	175,214	Logs .....	365,337	860,000
Rice .....	1,196	43,160	Merchandise .....	280	21,000
Miscellaneous .....	1,000	20,000			
Total .....	45,974	252,109	Total .....	367,200	950,855
Grand total .....				413,174	1,202,964

## V 9.

## IMPROVEMENT OF HARBOR AT SABINE PASS, TEXAS.

For previous projects and results accomplished thereunder see Annual Reports Chief of Engineers, 1875, page 947; 1877, page 75; 1878, page 609; 1882, pages 1436-1437; 1883, page 1054; 1891, pages 1831-1835; 1896, page 1814; 1898, page 1482; 1899, pages 1859-1862; 1900, pages 2276-2277; and 1901, pages 1912-1918.

The present project, approved by the Chief of Engineers July 3, 1902, provides for the expenditure of \$185,000 appropriated by the act of June 13, 1902—by repairs to and extension of the jetties in Sabine Pass, \$100,000; for dredging between the jetties and repairs to the U. S. dredge *Sabine*, \$60,000, and for dredging in Sabine Pass Harbor, from a point 1,000 feet north of the old life-saving station to the entrance to the Port Arthur Canal, \$25,000.

The Rittenhouse Moore Dredging Company resumed operations dredging in the harbor, under their contract of July 27, 1899, on August 16, 1902, removing 15,686 cubic yards of material that month, and fully completing all the work thereunder April 18, 1903, by the removal of approximately 1,423,164 cubic yards of material.

A contract was entered into with the Bowers Southern Dredging Company November 10, 1902, for dredging in the harbor in accordance with the approved project, under which contract work was commenced January 2, 1903, and continued until February 27, 1903, at which date the contract was fully completed by the removal of approximately 122,588 cubic yards of material from a channel extending from the lower limits of the town of Sabine Pass 1,800 feet eastward, and from a point 2,800 feet below to Fort Dowling, a distance of 1,140 feet.

The improved channel is 28,500 feet in length, with a minimum width of 340 feet and a minimum depth of 20.5 feet, and extends from the upper or inner end of the jetties to the entrance of the Port Arthur Canal.

The U. S. dredge *Sabine* continued operations, dredging in the channel between the jetties, from June 30, 1902, to September 15, 1902, when, under orders from the Chief of Engineers, she was sent to the South Pass of the Mississippi River to remove a shoal in the channel beyond the jetties. The *Sabine* returned to Sabine Pass November 1, 1902, and resumed work November 3, 1902, continuing until April 3, 1903, when she was again sent, under orders from the Chief of Engineers, to the South Pass of the Mississippi River for emergency work, from which place she had not returned at date of this report. During the past year 357,670 cubic yards of material have been removed from the jetty channel and dumped at sea. Recent soundings show an average depth of 21.5 feet of water throughout the entire length of the jetty channel. It is not believed that a depth of 25 feet can be maintained throughout the jetty channel until the jetties are raised to the level of mean high water.

1318 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

*Money statement.*

July 1, 1902, balance unexpended .....	\$261,553.77
June 30, 1903, amount expended during fiscal year .....	119,160.01
July 1, 1903, balance unexpended .....	142,393.76
July 1, 1903, amount covered by uncompleted contracts .....	100,000.00
(Amount (estimated) required for completion of existing project .....	1,016,573.00
Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903:	
For works of improvement .....	\$1,016,573
For maintenance of improvement .....	30,000
	1,046,573.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

ABSTRACT OF APPROPRIATIONS.

By act of Congress—	
From act approved August 30, 1852 (survey) .....	\$5,000.00
Allotted from act approved June 10, 1873 (survey) .....	2,000.00
By act of Congress—	
Approved March 3, 1875 .....	20,000.00
Approved August 14, 1876 .....	38,000.00
Approved June 18, 1878 (allotted) .....	30,000.00
Approved March 3, 1879 .....	25,000.00
Approved June 14, 1880 .....	50,000.00
Approved March 3, 1881 .....	150,000.00
Approved August 2, 1882 .....	150,000.00
Approved July 5, 1884 .....	200,000.00
Approved August 5, 1886 .....	198,750.00
Of August 11, 1888 .....	250,000.00
Approved September 19, 1890 .....	300,000.00
Approved July 13, 1892 .....	350,000.00
Of August 18, 1894 .....	<sup>a</sup> 271,000.00
Of June 3, 1896 .....	75,000.00
Approved June 4, 1897 (sundry civil) .....	480,000.00
Approved June 1, 1898 (sundry civil) .....	400,000.00
Approved March 3, 1899 (sundry civil) .....	264,000.00
Approved March 3, 1899 (river and harbor) .....	150,000.00
Approved June 6, 1900 (sundry civil) .....	36,000.00
Approved June 6, 1900 (emergencies in river and harbor works) (allotted) .....	10,000.00
Approved June 13, 1902 (river and harbor) .....	185,000.00
Total .....	3,639,750.00
Reverted to Treasury from act of June 4, 1897 .....	16,297.03
Net total .....	3,623,452.97

ABSTRACT OF CONTRACTS IN FORCE.

Name and address of bidder.	Character of work.	Amount involved
John Short, St. Louis, Mo .....	Repairs to and extension of east jetty .....	\$100,000

<sup>a</sup> The total amount of this appropriation was originally \$275,000, but of this sum \$4,000 was allotted by sundry civil act of March 2, 1895, for dredging through a bar at the mouth of the Sabine River, Texas, and was expended on that improvement.

# APPENDIX V—REPORT OF CAPTAIN BROMWELL.

1319

COMMERCIAL STATISTICS FROM JANUARY 1 TO DECEMBER 31, 1902.

## *Vessels entering and departing.*

Class.	Number.	Trips.	Net registered tonnage.
Steamers .....	57	416	367,506
Sailing vessels.....	13	42	14,670
Barges.....	32	492	359,454
Total .....	102	950	741,630

Draft of heaviest vessel: Light, 16 feet; loaded, 24 feet.

## *Shipments and receipts by water.*

Articles.	Tons.	Value.	Articles.	Tons.	Value.
SHIPMENTS.			RECEIPTS.		
Lumber .....	72,621	\$363,105	Machinery and iron pipe...	1,400	\$140,000
Fuel oil.....	597,875	1,350,375	Cement .....	1,360	20,400
Cotton.....	14,648	2,343,720	Creosote .....	1,250	25,000
Rice .....	14	525	Coal, asphalt.....	520	2,300
Total .....	685,158	4,057,725	Total.....	4,530	187,700
Grand total .....				689,688	4,245,425





## APPENDIX W.

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### IMPROVEMENT OF CERTAIN RIVERS AND HARBORS IN TEXAS.

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*REPORT OF CAPT. C. S. RICHÉ, CORPS OF ENGINEERS, OFFICER IN CHARGE, FOR THE FISCAL YEAR ENDING JUNE 30, 1903, WITH OTHER DOCUMENTS RELATING TO THE WORKS.*

#### IMPROVEMENTS.

- |   |   |
|---|---|
| 1. Galveston Harbor, Texas.   | 8. Brazos River, Texas, from Richmond to Old Washington.                    |
| 2. Galveston channel, Texas.  | 9. Mouth of Brazos River, Texas.  |
| 3. Channel from Galveston Harbor to Texas City, Texas.  | 10. Aransas Pass, Texas.  |
| 4. Galveston Ship channel and Buffalo Bayou, Texas.   | 11. Harbor at Brazos Santiago, Texas.                                       |
| 5. Operation and care of Morgans Canal, Texas.  | 12. Removing sunken vessels or craft obstructing or endangering navigation. |
| 6. Trinity River, Texas.  |   |
| 7. Brazos River between Velasco and Richmond, West Galveston Bay channel, Double Bayou, and the mouths of the adjacent streams, including Trinity River and Cedar Bayou, Texas. |   |

#### SURVEY.

13. Protection of the port of Galveston and property on Galveston Island, Texas.
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UNITED STATES ENGINEER OFFICE,  
*Galveston, Tex., July 20, 1903.*

GENERAL: I have the honor to forward herewith annual reports for the works of river and harbor improvements in my charge for the fiscal year ending June 30, 1903.

Very respectfully, your obedient servant,

C. S. RICHÉ,  
*Captain, Corps of Engineers.*

Brig. Gen. G. L. GILLESPIE,  
*Chief of Engineers, U. S. A.*

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#### W 1.

#### IMPROVEMENT OF GALVESTON HARBOR, TEXAS.

The river and harbor act approved June 13, 1902, appropriated \$350,000 for maintaining the entrance to the harbor and toward the

restoration of the jetties, in accordance with the report submitted in House Document No. 184, Fifty-sixth Congress, second session, and authorized the letting of a contract in the sum of \$400,000, exclusive of amounts appropriated. Project for expenditure of this appropriation submitted at the beginning of the fiscal year was approved.

#### OPERATIONS DURING THE YEAR—JETTIES.

An emergency contract was entered into on August 27, 1902, with Isaac Heffron, of Galveston, Tex., for furnishing riprap at Ninth street and Avenue A, Galveston, Tex., for repairing the shore branch of the south jetty. This contract was completed on June 1, 1903.

The unloading and placing of the riprap was done by hired labor. 27,763.16 tons of riprap were unloaded and placed between stations 9 and 143+63. This riprap has closed the most serious gaps in this part of the south jetty against all but excessive tides, and its effect in reducing sand deposit in Galveston channel is very pronounced.

Bids for repairing the jetties were advertised for on October 10, 1902, and opened December 10, 11, and 13, 1902. All bids received under this advertisement were rejected, as same were considered excessive. New bids were solicited in open market and opened March 11, 1903. One bid was received, that of J. M. O'Rourke & Co., of Galveston, Tex., and as prices bid were lower than received under advertisement of October 10, 1902, same was recommended for acceptance. A contract was entered into April 6, 1903, and approved May 13, 1903, with J. M. O'Rourke & Co., of Galveston, Tex., for granite blocks for the South jetty, delivered f. o. b. cars, United States track, Ninth street and Avenue A, or eastward thereof, or Fort Point, Galveston, Tex., \$2.59 per ton; and for granite blocks for the North jetty, properly placed in the jetty, \$3.89 per ton.

The unloading and placing of the granite in the south jetty is to be done by hired labor and United States plant.

No work had been done under this contract to the close of the fiscal year.

According to the terms of the contract work is to be commenced by August 16, 1903, and to be completed—south jetty on or before July 31, 1904, and north jetty on or before October 31, 1904.

#### DREDGING.

A description of the U. S. dredge *Gen. C. B. Comstock* will be found on pages 1530–1531, Annual Report of the Chief of Engineers for 1896.

The installing of oil-burning apparatus on the dredge for the burning of oil as fuel was completed during the fiscal year and has reduced the operating expenses of the dredge.

The dredge excavated, removed, and dumped from Galveston Harbor 386,459.2 cubic yards of material. A detailed account of the work done during the fiscal year will be found in the report of Mr. E. M. Hartrick, assistant engineer, forwarded herewith, to which attention is invited.

#### RESURVEY OF GALVESTON BAY.

The principal work during the year has been the making of minor surveys where necessary to supply omissions in the main survey and the beginning of the hydrography.

Probably two-thirds of the necessary hydrography has been completed and so far as finished a considerable shoaling of Galveston Bay is shown when compared with the Coast and Geodetic Survey chart made some forty years ago.

The drafting of the new chart has been begun and is making good progress. It is intended to prepare this chart in colors on the same system so successfully adopted for the charts of the Great Lakes. It is expected that the chart will be ready for issue some time during the coming fiscal year.

Full advantage has been taken of all surveys made for adjacent river and harbor works and all duplication of work has been avoided.

## SURVEYS.

The report of Mr. E. M. Hartrick, assistant engineer, gives detailed description of the surveys during the year. Attention is also invited to the map submitted with this report.

Prior to the hurricane of September 8, 1900, the action of the jetties alone was steadily improving the channel and less and less dredging was becoming necessary. The lowering of the jetties by this hurricane, however, permits the escape over them of much tidal energy. The tidal flow, especially during excessive tides, is no longer completely confined, and as a result there is much less scouring force available for the outer bar. Dredging will have to be continued from time to time, therefore, to maintain existing channel depths, and would have to be prosecuted vigorously to increase these depths. When the jetties are repaired, however, the necessity for dredging will again diminish.

Total amount expended on this improvement to June 30, 1903, \$8,609,097.22.

The balance available on June 30, 1903, and additional appropriation recommended, it is proposed to apply to operating the U. S. dredge *Gen. C. B. Comstock* in maintaining, widening, and deepening the channel between the jetties and repairing the north and south jetties.

*Money statement.*

July 1, 1902, balance unexpended.....	\$359,335.41
Amount appropriated by sundry civil act approved March 3, 1903.....	300,000.00
Proceeds of sale of condemned property.....	53.14
Transfer of tug <i>Anna</i> .....	10,000.00
	<hr/>
June 30, 1903, amount expended during fiscal year.....	669,388.55
	89,412.80
	<hr/>
July 1, 1903, balance unexpended.....	579,975.75
July 1, 1903, outstanding liabilities.....	7,810.56
	<hr/>
July 1, 1903, balance available.....	572,165.19
July 1, 1903, amount covered by uncompleted contracts.....	512,050.00
	<hr/>
(Amount (estimated) required for completion of existing project.....	850,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903:	
For works of improvement.....	\$400,000.00
For maintenance of improvement.....	50,000.00
	<hr/>
	450,000.00
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Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

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## ABSTRACT OF APPROPRIATIONS.

By act of—		By act of—	
July 11, 1870.....	\$25,000	March 3, 1891.....	\$630,000
March 3, 1871.....	20,000	August 5, 1892.....	450,000
June 10, 1872.....	31,000	March 3, 1893.....	1,000,000
June 23, 1874.....	60,000	August 18, 1894.....	600,000
March 3, 1875.....	150,000	January 25, 1895.....	200,000
August 14, 1876.....	142,000	March 2, 1895.....	1,160,000
June 7, 1878.....	75,000	February 26, 1896.....	300,000
June 18, 1878.....	50,000	June 3, 1896.....	50,000
March 3, 1879.....	100,000	June 11, 1896.....	840,000
June 14, 1880.....	175,000	June 4, 1897.....	500,000
March 3, 1881.....	250,000	March 3, 1899.....	50,000
March 4, 1882.....	100,000	June 13, 1902.....	350,000
August 2, 1882.....	800,000	March 3, 1903.....	300,000
August 5, 1886.....	300,000		
August 11, 1888.....	500,000		
September 19, 1890.....	500,000	Total.....	9,178,000

In addition to the above appropriations by Congress there has been collected from the steamship *Maritime* \$300; from Quartermaster's Department, United States Army, \$719.83; from sales of condemned property, \$53.14, and transfer of tug *Anna*, \$10,000, making a total of \$9,189,072.97

## CONTRACTS IN FORCE DURING FISCAL YEAR

### Emergency contract.

Contractor: Isaac Heffron, Galveston, Tex.  
 Character of work: Furnishing and delivering large and small riprap.  
 Rates: Large and small riprap, \$1.77 per ton delivered f. o. b. cars Ninth street and Avenue A, Galveston, Tex.  
 Date of approval: (Emergency contract).  
 Date of beginning work: Subject to notice from engineer officer.  
 Date of expiration: September 1, 1903. Contract completed June 1, 1903.

### Formal contract.

Contractor: J. M. O'Rourke & Co., Galveston, Tex.  
 Character of work: Repairing jetties.  
 Rates: For Galveston south jetty, large blocks, from 5 to 7 tons each, f. o. b. cars United States track Ninth street and Avenue A, or eastward thereof, or Fort Point, Galveston, Tex., \$2.59 per ton.  
 For Galveston north jetty, large riprap in pieces from 10 to 12 tons each, properly placed in the work, \$3.89 per ton.  
 Date of approval: May 13, 1903.  
 Date of beginning work: August 16, 1903.  
 Date of expiration: South jetty, July 31, 1904; north jetty, October 31, 1904.

## COMMERCIAL STATISTICS OF GALVESTON HARBOR, TEXAS, FOR FISCAL YEAR ENDING JUNE 30, 1903.

### Tonnage of vessels and revenue collected.

	Steam vessels.	Sailing vessels.	Total.	Total tonnage.
Entered.....	831	150	981	1,996,805
Cleared.....	809	346	1,155	2,127,655
Total.....	1,640	496	2,136	4,124,460

Duties on imports collected ..... \$391,727  
 All moneys collected at custom-house ..... 449,519

*Amount and value of freight entered and cleared.*

Articles.	Tons.	Approximate value.
Cotton (2,270,367 bales) .....	596,299	\$105,571,344
Cotton products.....	200,259	5,484,483
Ore .....	42,687	1,704,395
Wool .....	17,850	5,264,776
Grain .....	615,371	14,260,621
Sugar .....	100,378	10,037,800
Coal.....	49,316	401,406
General merchandise .....	459,402	297,593,680
Flour .....	40,328	1,494,530
Lumber and manufactures of wood .....	81,999	979,250
Cement .....	53,681	536,810
Petroleum .....	1,252,561	3,211,293
Manufactures of iron and steel .....	36,815	1,033,332
Cattle and other animals .....	5,791	336,987
Grand total .....	3,552,717	447,910,707

Increase of freight compared with last year ..... tons.. 1,752,740  
 Increase of value compared with last year..... \$187,073,353

## REPORT OF MR. E. M. HARTRICK, ASSISTANT ENGINEER.

GALVESTON, TEX., July 1, 1903.

CAPTAIN: I have the honor to submit the following report of operations for improving harbor at Galveston, Tex., during the fiscal year ending June 30, 1903.

## CONDITION OF THE WORK—JETTIES.

At the beginning of fiscal year the jetties were apparently in the same condition as reported on by Board of Engineers. (See H. Doc. No. 134, 56th Cong., 2d sess.)

At the end of fiscal year north jetty was in the same condition as reported above, as no work had been done and no further deterioration apparent. South jetty has been partially repaired by filling in the gaps in shore branch with sandstone riprap, preparatory to covering with granite blocks.

## DREDGING.

The depth of water in channel on the outer and inner bars has been maintained at a greater depth, aided by dredging, than the water alongside the wharves and slips of Galveston channel.

Mean tide fluctuation on outer bar, 2 feet; inner bar, 1.64 feet; Galveston channel, 1.12 feet.

## OPERATIONS DURING THE YEAR.

No work was done on north jetty, but on April 6, 1903, a contract was entered into with J. M. O'Rourke & Co., approved May 13, 1903, for "the repairing, restoring, and completing the jetties as recommended" in above report of the Board of Engineers. Work to commence August 16, 1903, and to be completed October 31, 1904, on north jetty, and on south jetty July 31, 1904.

## SOUTH JETTY.

At the beginning of fiscal year the trestle and track over shore branch of south jetty had been replaced to station 139+90 for the repair and construction of fortifications. At the end of the year it had been extended to station 143+63, a distance of 373 linear feet. A side track also has been constructed at Fort Point, between stations 68+50 and 75, a distance of 650 linear feet.

Between stations 9 and 143 27,763.16 tons of sandstone riprap have been used to fill up gaps and level off the riprap mound preparatory to covering with granite blocks. A derrick has been overhauled and fitted up and a railway track scale is under construction at Avenue A and Ninth street for the proper handling and weighing of stone for repair of jetties. At Government wharf, Fort Point, 46 fender piles were put in place and two galvanized-iron oil tanks erected in coal bin, with attachments and facilities for unloading and supplying fuel oil to Government dredges and

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boats. The tanks have a combined capacity of 30,875.14 gallons. Two wooden tanks, with a combined capacity of 34,881.95 gallons, have been contracted for and are expected to be delivered and erected in a short time.

DREDGING OPERATIONS IN GALVESTON HARBOR BY U. S. DREDGE GEN. C. B. COMSTOCK,  
G. M. PRENDERGAST, MASTER.

From July 1, 1902, to August 10, 1902, the dredge was moored at pier 10, undergoing repairs to machinery and piping and being changed from coal to an oil burner. The total cost of the change from coal to oil was \$2,805.40.

From August 11, 1902, to December 1, 1902, with the exception of twenty days, the dredge was continuously employed on Galveston channel improvements, from United States Reservation fence line to pier 35, and generally in front of wharves where the material was of such softness that dredge could not hold to her general average. From December 2, 1902, to June 30, 1903, the dredge has been continuously employed on Galveston Harbor (outer bar), with the exception of days when rough weather would not permit. At such times the dredge was employed on inner bar, Galveston Harbor, from second turn gas buoy to reservation fence line.

	Loads.	Cubic yards.
Outer bar .....	426	232, 818. 0
Elsewhere .....	280	158, 641. 2
Total .....	706	396, 459. 2

## Cost of dredging.

Operating cost per cubic yard .....	cents..	. 052
Total cost per cubic yard .....	do....	. 056
Wages .....		\$9, 986. 70
Subsistence .....		2, 560. 56
Fuel .....		4, 556. 44
Oils, waste, etc .....		577. 11
Miscellaneous supplies .....		229. 23
Ordinary maintenance .....		2, 159. 34
Contingent expenses .....		7. 00
Operating cost .....		20, 076. 38
Extraordinary repairs .....		350. 00
Addition to plant .....		1, 423. 00
Total cost .....		21, 849. 38

## Distribution of working time.

	Hours.	Minutes.
Anchor to cut .....	94	01
Pumping .....	872	41
Cut to dump .....	130	28
Dumping .....	48	24
Dump to cut .....	91	20
Dump to anchor .....	148	55
Time lost turning .....	27	04
Effective working time .....	1, 412	58

## Distribution of time.

	Hours.	Minutes.
Effective working time .....	1, 412	58
Delays for bad weather .....	154	36
Delays for repairs .....	439	18
Delays for other causes .....	235	08
Idle on account of Sundays and holidays .....	444	.....
Total time .....	2, 685	50

*Averages.*

	Cubic yards.
Average output per hour (outer bar and harbor) .....	443.00
Average output per minute (outer bar and harbor) .....	7.38
Average output per hour (Galveston Harbor) .....	341.00
Average output per minute (Galveston Harbor) .....	3.69
Average output per hour (outer bar) .....	550.00
Average output per minute (outer bar) .....	9.17

*Consolidated report of work done by U. S. dredge Gen. C. B. Comstock during fiscal year.*

	Loads.	Cubic yards.
Work of dredge for fiscal year .....	1,118	618,067

*Cost of dredging.*

Operating cost per cubic yard .....	cents..	.051
Total cost per cubic yard .....	do.....	.056
Wages .....		\$16,415.71
Subsistence .....		3,775.57
Fuel .....		6,953.28
Oils, waste, etc. ....		791.12
Miscellaneous supplies .....		867.65
Ordinary maintenance .....		2,505.53
Contingent expenses .....		58.50
Operating cost .....		31,367.36
Extraordinary repairs .....		350.00
Addition to plant (oil-burning apparatus) .....		2,805.40
Total cost .....		34,522.76

*Distribution of working time.*

	Hours.	Minutes.
Anchor to cut .....	117	28
Pumping .....	1,429	34
Cut to dump .....	238	56
Dumping .....	73	41
Dump to cut .....	156	32
Dump to anchor .....	220	59
Time lost turning .....	42	11
Effective working time .....	2,279	21

*Distribution of time.*

	Hours.	Minutes.
Effective working time .....	2,279	21
Delays for bad weather .....	198	11
Delays for repairs .....	448	08
Delays for other causes .....	470	37
Idle on account of Sundays and holidays .....	708	.....
Total time .....	4,104	12

*Average.*

	Cubic yards.
Average output per hour .....	428.00
Average output per minute .....	7.15



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BAR SURVEY.

On July 6 and 7, 1902, a survey was made of the outer bar, which shows a depth of 27½ feet in bar channel, an increase of 1½ feet since last annual survey. Except in this instance there is practically no change in the curves of depth. This increase in depth has been accomplished by the sea-going dredge *Gen. C. B. Comstock*, the weather being particularly favorable during the last few months for operations on the outer bar. Assistance from the jetties can not be claimed, as they still remain unrepaired from hurricane of September 8, 1900, and permit the tidal flow to escape over the low crest and through the gaps in the enrockment.

Very respectfully, your obedient servant,

E. M. HARTRICK,  
*Assistant Engineer.*

• Capt. C. S. RICHÉ,  
*Corps of Engineers.*

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W 2.

IMPROVEMENT OF GALVESTON CHANNEL, TEXAS.

At beginning of fiscal year project had been submitted for the expenditure of the amount appropriated by the river and harbor act approved June 13, 1902. Project submitted was approved

OPERATIONS DURING THE YEAR.

An emergency contract for constructing pile and brush dike on north side of the channel was entered into on September 13, 1902, with Moore & Sieber, of Texas City, Tex. This dike is for the purpose of holding the material dredged from the channel and preventing same being carried back into the channel by the action of the currents.

Under this contract to the close of the fiscal year contractors have completed 12,296 feet of dike without brush filling, and 2,460 feet of dike with brush filling.

Bids for dredging the channel were advertised for October 6, 1902, and opened December 8 and 9, 1902.

A formal contract for dredging was entered into with the Bowers Southern Dredging Company, of Galveston, Tex., on February 9, 1903, and approved March 2, 1903, work to commence June 14, 1903, and to be completed by December 31, 1904.

Under this contract to the close of fiscal year there has been dredged 60,000 cubic yards of material, completing a channel 550 feet wide at bottom, 29 feet deep for a distance of 1,000 feet.

The U. S. dredge *Gen. C. B. Comstock* removed 412 loads of material, aggregating 226,607.8 cubic yards, from the channel.

A detailed account of the work done by the U. S. dredge *Gen. C. B. Comstock* during the fiscal year will be found in the report of Mr. E. M. Hartrick, assistant engineer, forwarded herewith, to which attention is invited.

The U. S. dredge *Gen. H. M. Robert* excavated and deposited behind the pile-and-brush dike 44,000 cubic yards of material.

Total amount expended on this improvement to June 30, 1903, \$38,897.31.

The balance available on June 30, 1903, and additional appropriation recommended it is proposed to apply to dredging under contract and completion of pile-and-brush dike.

*Money statement.*

July 1, 1902, balance unexpended .....	\$100,000.00
Amount appropriated by sundry civil act approved March 3, 1903 .....	200,000.00
	<hr/>
June 30, 1903, amount expended during fiscal year .....	300,000.00
	38,897.31
	<hr/>
July 1, 1903, balance unexpended .....	261,102.69
July 1, 1903, outstanding liabilities .....	6,569.35
	<hr/>
July 1, 1903, balance available .....	254,533.34
	<hr/>
July 1, 1903, amount covered by uncompleted contracts .....	192,195.57
	<hr/>
{ Amount (estimated) required for completion of existing project .....	1,285,000.00
{ Amount that can be profitably expended in fiscal year ending June	
{ 30, 1905, in addition to the balance unexpended July 1, 1903 .....	200,000.00
{ Submitted in compliance with requirements of sundry civil act of June	
{ 4, 1897.	

## ABSTRACT OF APPROPRIATIONS.

By act of June 13, 1902 .....	\$100,000
By act of March 3, 1903 .....	200,000
	<hr/>
Total .....	300,000

## CONTRACTS IN FORCE DURING FISCAL YEAR.

*Emergency contract.*

Contractor: Moore & Sieber, Texas City, Tex.  
 Character of work: Constructing pile-and-brush dike.  
 Rates: Piling in place, 11 cents per linear foot. Brush in place and fastened, \$2.45 per cord.  
 Date of approval: (Emergency contract.)  
 Date of beginning work: January 27, 1903.  
 Date of expiration: Time limit waived.

*Formal contract.*

Contractor: Bowers Southern Dredging Company, Galveston, Tex.  
 Character of work: Dredging.  
 Rate: 8.3 cents per cubic yard.  
 Date of approval: March 2, 1903.  
 Date of beginning work: June 14, 1903.  
 Date of expiration: December 31, 1904.

## COMMERCIAL STATISTICS.

See report on improvement of Galveston Harbor, Texas, which applies to this improvement.

## REPORT OF MR. E. M. HARTRICK, ASSISTANT ENGINEER.

Galveston, Tex., July 1, 1903.

CAPTAIN: I have the honor to submit the following report of operations for improving Galveston channel, Texas, during the fiscal year ending June 30, 1903.

# 1330 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

## PROGRESS OF THE WORK.

Before the present fiscal year Galveston channel had been kept open and dredged by private enterprise, except that portion extending from Red Beacon to 30 feet of water in Bolivar channel. This was first improved by the city of Galveston building a bulkhead at Fort Point, which increased the depth over the inner bar. Then by the Government building a gabionnade, and later a shoreward extension of the south jetty, and dredging in channel with the Government seagoing dredge *Gen. C. B. Comstock*. The channel over the inner bar to Twenty-third street has a navigable depth of 26½ feet with a mean tidal fluctuation of 1.1 feet at old Government wharf.

It is contemplated to deepen the channel to 30 feet, 1,200 feet wide at bottom. The present contract calls for a depth of 30 feet, 500 feet wide at bottom from outer end of inner bar to Fifty-first street. Up to date there has been removed from channel about 60,000 cubic yards of material, leaving a cut about 1,000 feet long, 550 feet wide, with an average depth of 29 feet.

## OPERATIONS DURING THE YEAR.

### PILE-AND-BRUSH DIKE TO RETAIN SPOIL FROM CHANNEL.

On September 13, 1902, an emergency contract was entered into with Messrs. Moore & Sieber, of Texas City, Tex., to construct a pile-and-brush dike on Pelican flats, 1,400 feet distant from and parallel to the Galveston wharves. Work commenced on January 2, 1903, and up to date there has been driven 135,315 linear feet of piling and 212.1 cords of brush placed, making a bulkhead 14,756 feet long, of which 2,460 feet is complete with brush filling.

### DREDGING.

On February 9, 1903, a contract was entered into with the Bowers Southern Dredging Company, Galveston, Tex., approved March 2, 1903, to dredge a channel 550 feet wide at bottom and 30 feet deep from "Red Beacon westward to a point abreast of the western face of westernmost slip of the Southern Pacific Company's wharves." Work commenced on June 17, 1903, off Red Beacon, with contractors' dredges *George Sealy* and *No. 4*. The *George Sealy* is depositing to the northward on Pelican flats, over the pile-and-brush dike, and *No. 4* to the southward on Galveston Island. Up to date there has been removed about 60,000 cubic yards of material, making a channel 1,000 feet long of very nearly full width and depth.

### DREDGING OPERATIONS OF THE U. S. DREDGE GEN. C. B. COMSTOCK, IN GALVESTON CHANNEL, BY G. M. PRENDERGAST, MASTER.

From August 11, 1902, to December 1, 1902, the dredge was continuously employed on Galveston channel from line of United States reservation fence to pier 35. The average rate of material dredged per minute is much lower on this work, as about 35 per cent of the soft material is lost overboard after being pumped into hoppers.

From December, 1902, to June 30, 1903, but very few loads were dredged from Galveston channel, as all time possible, weather permitting, was given to Galveston harbor (outer bar).

Dredged.	Loads.	Total cubic yards.
Soft and mixed .....	412	226,607.8
Soft .....	108	60,058
Mixed .....	304	166,549.8

### Cost of dredging.

Operating cost (per cubic yard) .....	cents..	0.049
Total cost (per cubic yard) .....	do.....	.055
Wages .....		\$6,429.01
Subsistence .....		1,215.01
Fuel .....		2,396.84
Miscellaneous supplies .....		638.42
Oils, waste, etc. ....		214.01

Ordinary maintenance.....	\$346. 19
Contingent expenses.....	51. 50
Operating cost .....	11, 290. 98
Addition to plant.....	1, 382. 40
Total cost of dredging .....	12, 673. 38

*Distribution of working time.*

	Hours.	Minutes.
Anchor to cut.....	23	27
Pumping.....	556	53
Cut to dump.....	108	28
Dumping.....	25	17
Dump to cut.....	68	12
Dump to anchorage.....	72	4
Time lost turning.....	15	7
Effective working time .....	866	28

*Distribution of time.*

	Hours.	Minutes.
Effective working time.....	866	28
Delays for bad weather.....	43	35
Delays for repairs.....	8	45
Delays for other causes.....	235	34
Idle on account of Sundays and holidays.....	264	00
Total time .....	1, 418	22

*Averages.*

	Cubic yards.
Average output per hour (mixed) .....	437
Average output per minute (mixed).....	7. 27
Average output per hour (soft mud).....	343
Average output per minute (soft mud).....	5. 69
Average output per hour (soft and mixed).....	407
Average output per minute (soft and mixed).....	6. 78

Very respectfully, your obedient servant,

E. M. HARTRICK, *Assistant Engineer.*

Capt. C. S. RICHE, *Corps of Engineers.*

**W 3.**

IMPROVEMENT OF CHANNEL FROM GALVESTON HARBOR TO TEXAS CITY, TEXAS.

The dredging of this channel is being done under contract entered into with the Drake & Stratton Company, of New York, N. Y., for \$250,000. The original terms of the contract provided that \$100,000 should be paid when the channel had been deepened to a depth of 21 feet and the remainder of the price when the whole work had been completed in a manner satisfactory to the Secretary of War.

The river and harbor act approved June 13, 1902, provided for the amending of this contract as follows:

The Secretary of War is hereby authorized and directed, with the consent of the contractors now engaged in said work, or any contractors who may hereafter under-

## 1332 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

take the same, to modify the contract heretofore entered into for the performance of said work so that payments of five per centum of the whole contract price shall be made from time to time to said contractors for each one thousand linear feet along the length of said channel, whenever it shall satisfactorily appear to the Secretary of War that a depth of twenty-five feet and a width of one hundred feet at the bottom are obtained, until the sum of two hundred thousand dollars has been paid, after which no payments shall be made until the whole channel has been completed to the required width and depth, at which time the balance of the contract price shall be paid. And before such modification shall take effect the contractors for said work shall give bond to the United States, with sufficient surety or sureties, to be approved by the Secretary of War, conditioned upon the complete and faithful performance of said work as originally contracted for within two years from the date of said modification, in the sum of one hundred thousand dollars.

During the fiscal year supplemental articles of agreement were prepared and entered into, modifying the original contract in accordance with the terms of this act, and same were approved by the Secretary of War.

### OPERATIONS DURING THE YEAR.

Contractors completed according to contract a channel 13,000 feet long between stations 0 and 13, and 3,000 feet long between stations 16 and 19, a total of 16 sections of 1,000 feet each, for which 5 per cent of the contract price (\$12,500) has been paid for each section, or \$200,000 for the 16 sections.

Contractors also dredged channel between stations 13 and 16 to prescribed cross section.

Total length of channel dredged to prescribed cross section, 20,000 feet, between stations 0 and 20.

The remaining portion of the channel is dredged to 18 feet deep.

A detailed account of the work done will be found in the report of Mr. E. M. Hartrick, assistant engineer, forwarded herewith, to which attention is invited.

Amount expended on this improvement to June 30, 1903, \$200,000 from appropriation by Congress, and \$2,370.56 from the amount deposited by contractors for expenses of superintendence, inspection, etc.

### *Money statements.*

#### DEPOSIT OF CONTRACTORS.

July 1, 1902, balance unexpended .....	\$3, 048. 15
June 30, 1903, amount expended during fiscal year .....	418. 71
July 1, 1903, balance unexpended .....	2, 629. 44

#### GENERAL IMPROVEMENT.

July 1, 1902, balance unexpended .....	\$250, 000. 00
June 30, 1903, amount expended during fiscal year .....	200, 000. 00
July 1, 1903, balance unexpended .....	50, 000. 00
July 1, 1903, amount covered by uncompleted contracts .....	50, 000. 00

#### ABSTRACT OF APPROPRIATIONS.

By act of March 3, 1899 .....	\$250, 000. 00
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## CONTRACTS IN FORCE DURING THE FISCAL YEAR.

Contractor: The Drake & Stratton Company, New York, N. Y.  
 Character of work: Dredging.  
 Rates: \$250,000 (5 per cent of contract price to be paid for each 1,000 feet of completed channel, until \$200,000 has been paid, after which no payments shall be made until whole channel is completed).  
 Date of approval: January 22, 1900.  
 Date of beginning work: June 30, 1900.  
 Date of expiration: September 12, 1904.

## COMMERCIAL STATISTICS.

No commercial statistics for the fiscal year ending June 30, 1903, could be obtained. Inquiries by letter were made, but no replies have been received up to June 30, 1903.

## REPORT OF MR. E. M. HARTRICK, ASSISTANT ENGINEER.

GALVESTON, TEX., *July 1, 1903.*

CAPTAIN: I have the honor to submit the following report of operations on the improvement of the channel from Galveston Harbor to Texas City, Tex., during the fiscal year ending June 30, 1903:

## CONDITION OF THE WORK.

At the beginning of fiscal year the channel had been excavated to an average width of 120 feet at bottom and 17½ feet to 23 feet deep, except between stations 8 and 12+500, where a shoaling had occurred to 13½ feet.

At the end of fiscal year the channel was complete to station 20, a distance of 20,000 feet, to the full width and depth of 100 feet wide at bottom and 25 feet deep. Under provision of an act of Congress passed after the contract was started, 16,000 feet of channel has been paid for, amounting to \$200,000.

From station 20 to station 24 there remains to be excavated about 120,000 cubic yards. From station 24 to station 34, through a natural cut in Bolivar roads where there is a present depth of 21 to 28 feet, there remains about 100,000 yards to be excavated, or a total of about 220,000 cubic yards, to complete the channel to the required width and depth. The ruling depth of the channel at this date is 18 feet, the shoal being near station 20. It is believed that the work from station 20 to station 34 can be completed within the next two months.

In sounding over the completed portion of the channel from station 0 to 20 a silting up was observed. The depth was hard to determine with any degree of accuracy, as the soft material gave slight resistance to sounding pole, although a large flat plate was placed on the bottom of pole. The channel as originally excavated in the above section was about 27 feet deep and 110 feet wide at bottom. There is now not over 24 feet of water in the earlier completed sections. Including overdepth and extra width at turns and bends there has been over 15 per cent more material removed up to date than the specifications require.

## OPERATIONS DURING THE YEAR.

The total movement of the dredge over the different cuts has been 29,500 feet.

	Cubic yards.
Material removed from prescribed cross sections.....	892, 825
Actual excavation.....	1, 105, 330
Total material removed from prescribed cross section to date.....	2, 459, 440
Total actual excavation to date.....	2, 887, 490

The dredge worked 5,084 hours out of a possible 7,512 hours, or 16½ hours per 24-hour day. Principal delays: Repairs, 553 hours; storms and boisterous weather, 913 hours; miscellaneous, 962 hours.

Very respectfully, your obedient servant,

E. M. HARTRICK, *Assistant Engineer.*

Capt. C. S. RICHÉ,  
*Corps of Engineers.*

## W 4.

## IMPROVEMENT OF GALVESTON SHIP CHANNEL AND BUFFALO BAYOU, TEXAS.

The object of this improvement is to provide the city of Houston with a waterway to Galveston and the Gulf of Mexico, having a channel depth of 25 feet. (Annual Report of Chief of Engineers for 1898, p. 1516 et seq.)

This work formerly consisted of two separate improvements, i. e., improving ship channel in Galveston Bay, Texas, (Annual Report of Chief of Engineers for 1892, p. 1536 et seq.) and improving Buffalo Bayou, Texas (Annual Report Chief of Engineers for 1891, p. 1344 et seq.).

At the beginning of the fiscal year the approved project for expenditure of the available funds for improving ship channel in Galveston Bay, Texas, and improving Buffalo Bayou, were to be used in connection with appropriation for improving Galveston ship channel and Buffalo Bayou, Texas, in dredging a channel 70 feet wide and 17 feet deep, with the side slopes about 1 on 2, from deep water in Galveston Harbor, through Galveston Bay and Morgans cut (division 1), constructing pile and brush dike from Morgans cut to Redfish bar.

Active operations were being carried on by contract, and the condition of the work was as follows:

## DIVISION 1—SECOND SUBDIVISION.

The dike and channel were completed, having a navigable channel depth of from 17 to 20 feet at mean low tide, with a bottom width of 70 feet.

## DIVISION 1—FIRST SUBDIVISION.

Channel had been dredged to a depth of 17 feet at mean low tide, with a bottom width of 70 feet from stations 0+0 to 1+5 and 17+1 to 57+0.

## OPERATIONS DURING THE YEAR.

[Under the contract of Charles Clarke & Co.]

## DIVISION 1—FIRST SUBDIVISION.

Four hundred and fifty-six thousand eight hundred and forty-two and seventy-six one hundredths cubic yards of material were excavated as per prescribed cross section and 87,330.22 cubic yards below prescribed cross section from stations 1+5 to 17+1 and 57+0 to 67+2.

The contract of Charles Clarke & Co. was completed on December 10, 1902. Under this contract the channel was dredged to a depth of 17 feet and 70 feet wide through division 1.

Project for expenditure of funds appropriated by the river and harbor act of June 13, 1902, was approved, and funds are to be used in developing the proposed channel in divisions 1 and 2 to a uniform depth.

Bids for dredging Galveston ship channel and Buffalo Bayou were advertised for October 6, 1902, and opened on December 6 and 9, 1902.

Contract was entered into February 9, 1903, and approved March 2, 1903, with the Bowers Southern Dredging Company, of Galveston, Tex., for dredging divisions 1 and 2, work to be commenced on or before June 14, 1903, and to be completed on or before December 31, 1904.

The following work was done to the close of the fiscal year under the contract of the Bowers Southern Dredging Company:

#### DIVISION 1—FIRST SUBDIVISION.

Operations commenced March 26, 1903, and worked between stations 17+1 and 19+5. This work was not accepted to the close of the fiscal year owing to the channel not being dredged to prescribed depth.

#### DIVISION 1—SECOND SUBDIVISION.

Operations commenced March 20, 1903; 601,728.52 cubic yards of material were excavated as per prescribed cross section and 74,680.14 cubic yards below prescribed cross section, from stations 3+0 to 15+835.

#### DIVISION 2.

Operations commenced May 13, 1903; 73,455 cubic yards of material were excavated between stations 0 and 3. Between stations 0 and 1+5 channel is complete according to prescribed cross section; between stations 1+5 and 3 channel requires redredging to remove several shoal places.

The balance available on June 30, 1903, and additional appropriation recommended, is proposed to apply to dredging in sections 1 and 2.

Amount expended on these improvements to June 30, 1903, \$1,433,683.28.

#### *Money statement.*

July 1, 1902, balance unexpended.....	\$375, 124. 60
Amount appropriated by sundry civil act approved March 3, 1903.....	500, 000. 00
Proceeds of sales of condemned property.....	. 04
	<hr/>
June 30, 1903, amount expended during fiscal year.....	875, 124. 64
	131, 041. 03
	<hr/>
July 1, 1903, balance unexpended.....	744, 083. 61
July 1, 1903, outstanding liabilities.....	13, 695. 46
	<hr/>
July 1, 1903, balance available.....	730, 388. 15
	<hr/>
July 1, 1903, amount covered by uncompleted contracts.....	603, 778. 49
	<hr/>
Amount (estimated) required for completion of existing project.....	2, 900, 000. 00
Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903.....	700, 000. 00
Submitted in compliance with requirements of sundry civil act of June 4, 1897.	

#### ABSTRACT OF APPROPRIATIONS.

##### *Galveston ship channel and Buffalo Bayou.*

By act of—	
March 3, 1899.....	\$300, 000
June 13, 1902.....	300, 000
March 3, 1903.....	500, 000
	<hr/>
Total.....	1, 100, 000



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*Ship channel in Galveston Bay, Texas.*

By act of—		By act of—	
June 10, 1872 .....	\$10,000.00	August 2, 1882 .....	\$94,500.00
June 23, 1874 .....	10,000.00	August 11, 1888 .....	100,000.00
March 3, 1875 .....	35,200.00	September 19, 1890 .....	132,316.85
August 14, 1876 .....	72,000.00	July 13, 1893 .....	40,000.00
June 18, 1878 .....	75,000.00	August 18, 1894 .....	50,000.00
March 3, 1879 .....	80,000.00	June 3, 1896 .....	50,000.00
June 14, 1880 .....	50,000.00		
March 3, 1881 .....	50,000.00	Total .....	849,016.85

*Buffalo Bayou, Texas.*

By act of—		By act of—	
March 3, 1881 .....	\$25,000	July 13, 1892 .....	\$25,000
August 2, 1882 .....	50,000	August 18, 1894 .....	15,000
July 2, 1884 .....	25,000	June 3, 1896 .....	20,000
August 5, 1886 .....	18,750		
August 11, 1888 .....	25,000	Total .....	228,750
September 19, 1890 .....	25,000		

In addition to the above appropriations by Congress, 4 cents have been received from the sales of condemned property.

CONTRACTS IN FORCE DURING THE FISCAL YEAR.

Contractor: Charles Clarke & Co., Galveston, Tex.  
Character of work: Dredging and constructing pile and brush dike.  
Rates: Dredging, 6.98 cents per cubic yard; dike, 11½ cents per linear foot of piling required.

Date of approval: August 3, 1900.  
Date of beginning work: December 4, 1900.  
Date of expiration: Contract completed, December 10, 1902.

Contractor: Bowers Southern Dredging Company, Galveston, Tex.  
Character of work: Dredging.  
Rates: Division 1, 8½ cents per cubic yard; division 2, 14 cents per cubic yard.  
Date of approval: March 2, 1903.  
Date of beginning work: June 14, 1903.  
Date of expiration: December 31, 1904.

COMMERCIAL STATISTICS.

The only commercial statistics that could be obtained for the fiscal year was the amounts carried by the Houston Direct Navigation Company, as follows:

Vessels using the bayou and ship channel, 22 (5 steam vessels and 17 barges); average length, 160 feet; average depth, 8 feet.

	Tons.	Approximate value.
Cotton (349,271 bales) .....	91,289	\$15,717,285
Cotton products (meal and cake) .....	128	1,536
Lumber (ash, oak, and pine) .....	1,345	20,175
Bank sand .....	953	346
Reef shell .....	8,497	7,725
Cement .....	28	560
San Jacinto sand .....	4,447	1,977
Green coffee .....	219	35,040
Cotton bagging .....	1,375	10,000
Roofing slate .....	99	1,980
Piling .....	1,309	15,708
Plaster .....	15	300
Total .....	109,704	15,812,632

For number of vessels and tonnage passing through Morgans Canal, see report on *operating and care of Morgans Canal* (Appendix W 5).

## W 5.

## OPERATION AND CARE OF MORGANS CANAL, TEXAS.

At the beginning of the fiscal year the repair of the bulkhead of the canal was practically completed by the contractor. There only remained to be done the bolting on of the lower course of waling pieces to the guide piles and the trimming of the tops of piles to grade. This work was completed during July, 1902, and the work accepted and paid for.

A watchman was stationed at the canal during the year to enforce the regulations governing the navigation of the canal.

The amount expended during the fiscal year was as follows:

James A. Black, salary for eleven months.....	\$330. 00
Moore & Sieber, furnishing and placing fence posts.....	110. 70
Moore & Sieber, removing worthless bulkhead and constructing new....	4, 223. 98
Superintendence, inspection, etc.....	300. 77
<b>Total.....</b>	<b>4, 965. 45</b>

*Money statement.*

July 1, 1902, balance unexpended.....	\$4, 636. 75
Amount allotted July 18, 1902.....	360. 00
Amount allotted June 24, 1903.....	360. 00
	<b>5, 356. 75</b>
June 30, 1903, amount expended during fiscal year.....	<b>4, 965. 45</b>
July 1, 1903, balance unexpended.....	391. 30
July 1, 1903, outstanding liabilities.....	30. 00
July 1, 1903, balance available.....	<b>361. 30</b>

## ABSTRACT OF ALLOTMENTS.

December 2, 1896.....	\$240	June 11, 1901.....	\$5, 000
July 16, 1897.....	360	July 18, 1902.....	360
July 1, 1898.....	360		
July 1, 1899.....	360	<b>Total.....</b>	<b>7, 040</b>
July 14, 1900.....	360		

## CONTRACT IN FORCE DURING THE FISCAL YEAR FOR REPAIRING BULKHEAD AT MORGANS CANAL, TEXAS.

Contractor: Moore & Sieber, Texas City, Tex.

Character of work: Repairing bulkhead.

Rates: Constructing bulkhead complete, \$6.05 per linear foot; removing worthless bulkhead, \$1.33½ per linear foot.

Date of approval: No date; emergency contract.

Date of beginning work: May 6, 1902.

Date of expiration: August 25, 1902. Contract completed July 31, 1902.

## COMMERCIAL STATISTICS.

*Number and tonnage of vessels passing up and down through Morgans Canal during the fiscal year ending June 30, 1903, as reported by the watchman at the canal.*

Vessels engaged in carrying freight.....	1, 724
Tonnage (registered).....	136, 587
Vessels in the employ of the United States or its contractors.....	492
Tonnage (registered).....	6, 108
<b>Total number of vessels.....</b>	<b>2, 216</b>
<b>Total tonnage (registered).....</b>	<b>142, 695</b>

## W 6.

## IMPROVEMENT OF TRINITY RIVER, TEXAS.

## OPERATIONS DURING THE YEAR.

## SECTION 1.

A snag boat and quarter boat was constructed at Dallas, Tex.

Trees were cut and cleaned from the banks of the river between mile stations 512.38 and 482.94, a distance of 29.44 miles, and between mile stations 480.66 and 462.53, a distance of 18.13 miles.

Snag boat removed snags from the river between stations 512.38 and 510.68, a distance of 1.7 miles, and cut a channel through drift and cleaned bed of river from station 503 to station 498.8, a distance of 4.2 miles.

Work during the year has been retarded by rains and unusual floods.

## MOUTH TO SECTION 1.

Preliminary design of Lock No. 1 has been submitted.

The U. S. dredge *Gen. H. M. Robert* removed from main pass at mouth of river all snags, 700 feet of old bulkhead, and dredged 3,100 feet to an average depth of 8 feet and 75 feet wide.

Total amount expended on this improvement to June 30, 1903, \$29,276.11.

The balance available on June 30, 1903, and additional appropriation recommended it is proposed to apply to snagging and cleaning section and snagging and cleaning and constructing locks and dams from mouth to section 1.

*Money statement.*

July 1, 1902, balance unexpended .....	\$125,000. 00
Amount appropriated by sundry civil act approved March 3, 1903 .....	250,000. 00
	<hr/>
	375,000. 00
June 30, 1903, amount expended during fiscal year .....	29,276. 11
	<hr/>
July 1, 1903, balance unexpended .....	345,723. 89
July 1, 1903, outstanding liabilities .....	5,923. 76
	<hr/>
July 1, 1903, balance available .....	339,800. 13
	<hr/>
{ Amount (estimated) required for completion of existing project .....	3,625,000. 00
{ Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903 .....	275,000. 00
{ Submitted in compliance with requirements of sundry civil act of June 4, 1897.	

## ABSTRACT OF APPROPRIATIONS.

By act of June 13, 1902 .....	\$125,000
By act of March 3, 1903 .....	250,000
	<hr/>
Total .....	375,000

## COMMERCIAL STATISTICS.

No commercial statistics for the fiscal year could be obtained.

## W 7.

IMPROVEMENT OF THE BRAZOS RIVER, BETWEEN VELASCO AND RICHMOND, WEST GALVESTON BAY CHANNEL, DOUBLE BAYOU, AND THE MOUTHS OF THE ADJACENT STREAMS, INCLUDING TRINITY RIVER AND CEDAR BAYOU, TEXAS.

The available funds at the beginning of the fiscal year for improving Brazos River, Texas, channel in West Galveston Bay, and Trinity River, Texas, were to be used in dredging and snagging at those points with the combined dredge and snag boat constructed from the appropriation of March 3, 1899.

The appropriation of June 13, 1902, is to be expended in operating the dredge in dredging and snagging at various rivers, bayous, and creeks, and in the purchase of the canal from West Galveston Bay to the mouth of the Brazos River.

The object of this improvement is to obtain a navigable-channel depth of from 4 to 6 feet across the bars at the mouths of most of the streams and bayous along the Texas coast. (See also H. Doc. No. 446, Fifty-sixth Congress, first session, reprinted as pp. 2438-2453, Annual Report of the Chief of Engineers for 1900.)

At the beginning of the fiscal year the dredge was practically complete, except electric-light wiring and necessary furnishing for cabin and outfit for operating the dredge. Orders had been placed for furnishings and outfit for operating dredge and electric-light wiring was being installed. Steam had been gotten up in the boilers and various parts of the dredge given a preliminary steam test.

## OPERATIONS DURING THE YEAR.

## AT DOUBLE BAYOU, TEXAS.

The dredge *Gen. H. M. Robert* was completed and put in commission August 6, 1902, and commenced active operations at Double Bayou, Texas, on August 12, 1902.

Thirteen thousand three hundred and four and eighty-two one-hundredths cubic yards of material were excavated from the channel leading into Double Bayou.

Owing to the encountering of heavy clay, which could not be excavated by the dredge without the aid of a new suction or a mechanical cutter, operations were suspended at Double Bayou on October 9, 1902, and the dredge removed to the mouth of the Trinity River.

## AT MOUTH OF TRINITY RIVER, TEXAS.

The dredge removed from the Main Pass all snags, 700 feet of old bulkhead, and dredged about 3,100 feet of pass to a depth of 8 feet and 75 feet wide.

## AT HANNA'S REEF.

Channel across this reef (Ladies Pass) connecting lower Galveston Bay, East Bay, and East Bay Bayou was dredged to a depth of 7 feet and 45 to 60 feet wide for a distance of 900 feet.

A new suction was purchased during the year, with which it is thought the dredge will be able to handle the heavy clay encountered

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at Double Bayou. Up to the close of the fiscal year the new suction had not been installed.

Oil-burning apparatus has been installed on the dredge for the burning of oil as fuel. The use of oil as fuel has reduced the operating expenses of the dredge.

A description of the U. S. dredge *Gen. H. M. Robert* will be found on pages 1381-1382, Annual Report of the Chief of Engineers for 1902.

The canal from West Galveston Bay to the mouth of the Brazos River was purchased and paid for.

Amount expended on this improvement to June 30, 1903, was \$102,049.85.

The balances available June 30, 1903, and additional appropriation recommended it is proposed to apply to operating the U. S. dredge *Gen. H. M. Robert* at Double Bayou, Brazos River, mouth of Trinity River, channel in West Galveston Bay, Cedar Bayou, Texas, and canal from West Galveston Bay to the mouth of the Brazos River, in dredging, snagging, etc., as may be necessary.

*Money statement.*

July 1, 1902, balance unexpended .....	\$59, 068. 41
June 30, 1903, amount expended during fiscal year .....	46, 118. 26
July 1, 1903, balance unexpended .....	12, 950. 15
July 1, 1903, outstanding liabilities .....	35. 00
July 1, 1903, balance available .....	12, 915. 15
{ Amount (estimated) required for completion of existing project .....	130, 000. 00
{ Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903 .....	100, 000. 00
{ Submitted in compliance with requirements of sundry civil act of June 4, 1897.	

ABSTRACT OF APPROPRIATIONS.

*Brazos River between Velasco and Richmond, West Galveston Bay channel, Double Bayou, and the mouths of the adjacent streams.*

By act of—	
March 3, 1899 .....	\$65, 000
June 13, 1902 .....	50, 000
Total .....	115, 000

COMMERCIAL STATISTICS.

No commercial statistics for the fiscal year ending June 30, 1903, could be obtained. Inquiries by letter were made, but no replies have been received up to June 30, 1903.

(a) TRINITY RIVER.

For work done on this improvement during the fiscal year, see report herewith on improvement of the Brazos River between Velasco and Richmond, West Galveston Bay channel, Double Bayou, and the mouths of the adjacent streams.

Amount expended on this improvement to June 30, 1903, \$84,000.

*Money statement.*

July 1, 1902, balance unexpended .....	\$6, 750. 63
June 30, 1903, amount expended during the fiscal year .....	6, 750. 63

## ABSTRACT OF APPROPRIATIONS.

By act of—		By act of—	
June 18, 1878 .....	\$10, 000	July 13, 1892 .....	\$10, 000
March 3, 1879 .....	2, 500	August 18, 1894 .....	5, 000
June 14, 1880 .....	4, 000	June 3, 1896 .....	5, 000
March 3, 1881 .....	10, 000	March 3, 1899 .....	7, 000
August 2, 1882 .....	8, 000		
August 11, 1888 .....	12, 500	Total .....	84, 000
September 19, 1890 .....	10, 000		

## COMMERCIAL STATISTICS OF TRINITY RIVER, TEXAS, FOR THE FISCAL YEAR ENDING JUNE 30, 1903.

Vessels using the river, 24 (4 steam vessels, 10 barges, and 10 sailing vessels); draft, 5 feet; total tonnage, 2,500.

*Amount and value of freight transported.*

Articles.	Amount.	Approximate value.
Charcoal .....	20	\$550
Cattle .....	200	2, 000
Lumber .....	16, 000	150, 000
Wood .....	1, 500	4, 500
General merchandise .....	3, 750	75, 000

## (b) CEDAR BAYOU.

No work was done up to the close of the fiscal year.

The amount appropriated by the river and harbor act approved June 13, 1902, is to be expended in maintaining the entrance and approaches to the bayou by dredging with the U. S. dredge *Gen. H. M. Robert*.

Amount expended on this improvement to June 30, 1903, \$32,150.

The available balance on June 30, 1903, it is proposed to apply to maintaining the channel by dredging with the U. S. dredge *Gen. H. M. Robert*.

*Money statement.*

July 1, 1902, balance unexpended .....	\$5, 000. 00
July 1, 1903, balance unexpended .....	5, 000. 00

## ABSTRACT OF APPROPRIATIONS.

By act of—	
September 19, 1890 .....	\$18, 150
July 13, 1892 .....	14, 000
July 13, 1902 .....	5, 000
Total .....	37, 150

## (c) CHANNEL IN WEST GALVESTON BAY.

No work was done during the present fiscal year because a greater depth of water exists in the bay than is found in the Galveston and Brazos Canal. The condition of this canal is described in House Document No. 447, Fifty-sixth Congress, first session, printed also on pages 2418-2425 of the Annual Report of the Chief of Engineers for 1900.

The canal was purchased during the fiscal year for \$30,000, which is less than it would have cost to reproduce existing conditions if the canal had never been built.

In future, work on this improvement will be conducted in connection with appropriation for improvement of the Brazos River between Velasco and Richmond, West Galveston Bay channel, Double Bayou, and the mouths of adjacent streams. (See report herewith on improvement of the Brazos River between Velasco and Richmond, West Galveston Bay channel, Double Bayou, and the mouths of the adjacent streams.)

Total amount expended on this improvement to June 30, 1903, \$19,775.97.

The balance available on June 30, 1903, it is proposed to apply to dredging with the U. S. dredge *Gen. H. M. Robert*.

*Money statement.*

July 1, 1902, balance unexpended.....	\$5, 224. 03
July 1, 1903, balance unexpended.....	5, 224. 03

## ABSTRACT OF APPROPRIATIONS.

By act of—	
July 13, 1892.....	\$15, 000
August 18, 1894.....	5, 000
June 3, 1896.....	5, 000
Total.....	25, 000

## COMMERCIAL STATISTICS.

No commercial statistics for the fiscal year ending June 30, 1903, could be obtained. Inquiries by letter were made, but no replies have been received up to June 30, 1903.

## (d) BRAZOS RIVER.

No work was done during the fiscal year.

In future, work on this improvement will be conducted in connection with appropriation for the improvement of the Brazos River between Velasco and Richmond, West Galveston Bay channel, Double Bayou, and the mouths of adjacent streams. (See report herewith on the improvement of the Brazos River between Velasco and Richmond, West Galveston Bay channel, Double Bayou, and the mouths of adjacent streams.)

Amount expended on this improvement to June 30, 1902, \$22.35.

The balance available on June 30, 1903, it is proposed to apply to dredging and snagging with the U. S. dredge *Gen. H. M. Robert*.

*Money statement.*

July 1, 1902, balance unexpended .....	\$4,977.65
July 1, 1903, balance unexpended .....	4,977.65

## APPROPRIATION.

June 3, 1896 .....	\$5,000
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## COMMERCIAL STATISTICS.

No commercial statistics for the fiscal year ending June 30, 1903, could be obtained. Inquiries by letter were made, but no replies have been received up to June 30, 1903.

## W 8.

## IMPROVEMENT OF BRAZOS RIVER, TEXAS, FROM RICHMOND TO OLD WASHINGTON.

No work has been done up to the close of the last fiscal year except to submit a project for expenditure of the amount appropriated by the river and harbor act approved June 13, 1902.

Available funds are to be expended in removing snags and overhanging timber and in narrowing the river at its shoals by spur dikes.

## OPERATIONS DURING THE YEAR.

Force was organized at Old Washington, Texas.

Hull of snag boat, pile-driver boat, office boat, mess boat, and one material barge completed and launched, and at close of fiscal year are nearly ready for work.

The balance available on June 30, 1903, and additional appropriation recommended it is proposed to apply to removing snags and overhanging trees and narrowing the river at its shoals by spur dikes from Richmond to Old Washington, Texas.

Amount expended on this improvement to June 30, 1903, \$12,066.92.

*Money statement.*

July 1, 1902, balance unexpended .....	\$150,000.00
June 30, 1903, amount expended during fiscal year .....	12,066.92
July 1, 1903, balance unexpended .....	137,933.08
July 1, 1903, outstanding liabilities .....	3,554.12
July 1, 1903, balance available .....	134,378.96
Amount (estimated) required for completion of existing project .....	50,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903 .....	50,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897.	

## ABSTRACT OF APPROPRIATIONS.

By act of June 13, 1902 .....	\$150,000
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## COMMERCIAL STATISTICS.

No commercial statistics for the fiscal year ending June 30, 1903, could be obtained. Inquiries by letter were made, but no replies have been received up to June 30, 1903.



## W 9.

## IMPROVEMENT OF THE MOUTH OF BRAZOS RIVER, TEXAS.

Project for expenditure of amount appropriated by the river and harbor act of June 13, 1902, submitted at close of last fiscal year, was approved.

For condition of work to June 30, 1901, see Annual Report of the Chief of Engineers for 1901, pages 1940 et seq., and House Document No. 133, Fifty-sixth Congress, second session.

Under date of October 10, 1902, bids for repairing the jetties were advertised for and opened December 13, 1902; all bids received under this advertisement were rejected, as same were considered excessive.

New bids were solicited in open market and opened March 11, 1903; one bid was received, that of Moore & Sieber, of Texas City, and as prices bid were lower than bids received under advertisement of October 10, 1902, same was recommended for acceptance.

A contract was entered into April 14, 1903, and approved May 13, 1903, with Moore & Sieber, of Texas City, Tex., for repairing the jetties, etc. No work has been done under this contract to the close of the fiscal year.

According to the terms of the contract, work is to be commenced by August 23, 1903, and to be completed by December 31, 1903.

Total amount expended on this improvement to June 30, 1903, \$230,953.77.

The balance available on June 30, 1903, and additional appropriation recommended, it is proposed to apply to repairing the jetties and construction of cribs and spur dikes in the river.

*Money statement.*

July 1, 1902, balance unexpended .....	\$63, 127. 44
Proceeds of sale of condemned property.....	8. 63
	<u>63, 136. 07</u>
June 30, 1903, amount expended during fiscal year .....	331. 21
July 1, 1903, balance unexpended .....	<u>62, 804. 86</u>
July 1, 1903, amount covered by uncompleted contracts.....	<u>50, 790. 00</u>
{ Amount (estimated) required for completion of existing project .....	275, 000. 00
{ Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903 .....	275, 000. 00
{ Submitted in compliance with requirements of sundry civil act of June 4, 1897.	

## ABSTRACT OF APPROPRIATIONS.

By act of—		By act of—	
June 14, 1880 .....	\$40, 000	March 3, 1899.....	\$85, 000
March 3, 1881.....	40, 000	June 13, 1902 .....	50, 000
August 2, 1882 .....	50, 000		
July 5, 1884.....	10, 000	Total .....	<u>293, 750</u>
August 5, 1886 .....	18, 750		

In addition to the above appropriations by Congress, there has been received \$8.63 from sales of condemned property, making a total of \$293,758.63.

## CONTRACTS IN FORCE DURING FISCAL YEAR.

Contractor: Moore & Sieber, Texas City, Tex.

Character of work: Repairing jetties and constructing cribs and spurs.

Rates: Small riprap placed in jetties, cribs, and spurs, \$3.14 per ton; large riprap placed in jetties, \$3.95 per ton; logs placed in cribs and spurs, covering all necessary iron fastenings and brush, 35 cents per linear foot.

Date of approval: May 13, 1903.

Date of beginning work: August 23, 1903.

Date of expiration: December 31, 1903.

## COMMERCIAL STATISTICS.

No commercial statistics for the fiscal year ending June 30, 1903, could be obtained. Inquiries by letter were made, but no replies have been received up to June 30, 1903.

## W 10.

## IMPROVEMENT OF ARANSAS PASS, TEXAS.

The project for expenditure of amount appropriated by the river and harbor act of June 13, 1902, submitted at close of last fiscal year was approved.

Under date of October 10, 1902, bids for jetty work were advertised for and opened December 12 and 13, 1902. All bids received under this advertisement were rejected, as same were considered excessive.

New bids were solicited in open market and opened March 11, 1903. One bid was received, that of Henry Clay Ripley, of Ann Arbor, Mich., and as prices bid were lower than bids received under advertisement of October 10, 1902, same was recommended for acceptance. A contract was entered into April 6, 1903, and approved April 20, 1903, with Henry Clay Ripley, of Ann Arbor, Mich. No work has been done under this contract to the close of the fiscal year.

According to the terms of the contract work is to be commenced by July 23, 1903, and to be completed by January 31, 1904.

Bids for removing part of old Government jetty were advertised for February 23, 1903, and opened March 25, 1903. One bid was received for the work from Moore & Sieber, of Texas City, Tex., and amount of same was \$46,000. This bid was accepted and formal contract was entered into April 22, 1903, and approved May 13, 1903. No work has been done under this contract to the close of the fiscal year.

According to the terms of the contract work is to be commenced by August 23, 1903, and to be completed by August 31, 1903.

Amount expended on this improvement to June 30, 1903, \$637,627.91, exclusive of \$9,938.93 subscribed by the citizens of Rockport and Corpus Christi.

The balance available on June 30, 1903, and additional appropriation recommended, it is proposed to apply to repairing and extending the north jetty and removing the old Government jetty.

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## *Money statement.*

July 1, 1902, balance unexpended .....	\$255,589.08
June 30, 1903, amount expended during fiscal year .....	1,966.99
July 1, 1903, balance unexpended .....	253,622.09
July 1, 1903, amount covered by uncompleted contracts.....	246,000.00
{ Amount (estimated) required for completion of existing project .....	1,430,000.00
{ Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903.....	300,000.00
{ Submitted in compliance with requirements of sundry civil act of June 4, 1897.	

## ABSTRACT OF APPROPRIATIONS.

By act of—		By act of—	
March 3, 1879.....	\$35,000	August 11, 1888 .....	\$100,000
June 14, 1880 .....	65,000	March 3, 1899.....	60,000
March 3, 1881 .....	80,000	June 13, 1902 .....	250,000
August 2, 1882 .....	100,000		
July 5, 1884.....	100,000	Total .....	891,250
August 5, 1886 .....	101,250		

## CONTRACTS IN FORCE DURING FISCAL YEAR.

Contractor: Henry Clay Ripley, Ann Arbor, Mich.

Character of work: Jetty.

Rates: Small riprap placed in the jetty, \$3.75 per ton; large riprap (granite) placed in the jetty, \$4.60 per ton; large riprap obtained in the quarrying of small riprap placed in the jetty, \$4.25 per ton; large block placed in the jetty, \$5.10 per ton.

Date of approval: April 20, 1903.

Date of beginning work: July 23, 1903.

Date of expiration: January 31, 1904.

Contractor: Moore & Sieber, Texas City, Tex.

Character of work: Removing portion of old Government jetty.

Rates: \$46,000.

Date of approval: May 13, 1903.

Date of beginning work: August 23, 1903.

Date of expiration: August 31, 1903.

## COMMERCIAL STATISTICS.

No commercial statistics for the fiscal year ending June 30, 1903, could be obtained. Inquiry by letter was made, but no reply has been received up to June 30, 1903.

## W II.

### IMPROVEMENT OF HARBOR AT BRAZOS SANTIAGO, TEXAS.

No work done during the fiscal year.

## *Money statement.*

July 1, 1902, balance unexpended .....	\$54,836.84
July 1, 1903, balance unexpended .....	54,836.84

## ABSTRACT OF APPROPRIATIONS.

By act approved—		By act approved—	
June 14, 1880.....	\$25,000	August 5, 1886.....	\$37,500
March 3, 1881.....	75,000	August 11, 1888.....	25,000
August 2, 1882.....	60,000		
July 5, 1884.....	25,000	Total .....	\$247,500

## COMMERCIAL STATISTICS.

No commercial statistics for the fiscal year ending June 30, 1903, could be obtained. Inquiries by letter were made, but no replies have been received up to June 30, 1903.

## W 12.

## REMOVING SUNKEN VESSELS OR CRAFT OBSTRUCTING OR ENDANGERING NAVIGATION.

At the beginning of the fiscal year contract had been entered into with Charles J. Bryant, of Galveston, Tex., for removing the following wrecks:

Dredge *No. 3*, wooden hull; gross tonnage, 90; length, 100 feet; breadth, 36 feet; depth, 10 feet; built in 1891 at Galveston, Tex. Burned June 30, 1901. Contained Osgood dredging machinery, part of which has been removed. Lies on north bank of Galveston channel, about 1,000 feet northeast from Red Beacon, in from 18 to 24 feet of water.

Barge *No. 3*, decked, wooden hull; length, 131 feet; breadth, 23 feet; depth, 5 feet. Supposed to have been sunk during hurricane of September 8, 1900. Lies on north side of channel in Buffalo Bayou, below mouth of Greens Bayou, in Massies reach, in from 8 to 10 feet of water.

Dredge boat, wooden hull; length, 65 feet; breadth, 27 feet; depth, 6 feet. Sunk during hurricane of September 8, 1900. Is a crane dredge of the Osgood type. Boiler and machinery supposed to be complete. Lies just south of channel in Buffalo Bayou, about 500 feet above the upper end of Clinton wharf, in from 12 to 20 feet of water.

Flatboat *Daisy*, open hold, wooden hull; length, 75 feet; breadth, 22 feet; depth, 5½ feet. Sunk against south bank of Buffalo Bayou, on point just above Inman compress. Date of wreck unknown.

Contractor completed removing all the wrecks on September 16, 1902.

The amount allotted for removal of these wrecks was \$3,000, and was expended as follows:

Expended to June 30, 1902—	
Printing specifications .....	\$26.98
Advertising for bids .....	19.38
Office expenses.....	75.83
	122.19
Expended from July 1, 1902—	
Charles J. Bryant, removing wreck, dredge <i>No. 3</i> .....	1,150.00
Charles J. Bryant, removing wreck, barge <i>No. 3</i> .....	300.00
Charles J. Bryant, removing wreck, dredge boat.....	600.00
Charles J. Bryant, removing wreck, flatboat <i>Daisy</i> .....	100.00
Superintendence and inspection, office expenses, etc .....	364.89
Total cost of removing wrecks .....	2,637.08
Deposited to credit of the appropriation.....	362.92
	3,000.00

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CONTRACTS IN FORCE DURING FISCAL YEAR FOR REMOVING WRECKS, DREDGE NO. 3, BARGE NO. 3, DREDGE BOAT, AND FLATBOAT DAISY.

Contractor: Charles J. Bryant.

Character of work: Removing wrecks.

Rates: Dredge No. 3, \$1,150; barge No. 3, \$300; dredge boat, \$600; flatboat Daisy, \$100.

Date of approval: May 7, 1902.

Date of beginning work: June 11, 1902.

Date of expiration: September 16, 1902. (Work completed.)

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W 13.

REPORT OF A BOARD OF ENGINEERS RELATIVE TO THE PROTECTION OF THE PORT OF GALVESTON, TEX., AND THE PROPERTY LOCATED ON GALVESTON ISLAND FROM EXCESSIVE STORMS, BY A BREAKWATER OR OTHER MEANS, AND REPORT UPON THE FEASIBILITY, ADVISABILITY, AND COST THEREOF, AND THE PROBABLE EFFECT OF SUCH IMPROVEMENT UPON THE GENERAL CONDITION OF THAT PORT AND ITS COMMERCE.

NEW ORLEANS, LA., *December 19, 1902.*

GENERAL: The Board of Engineers upon the protection of the port of Galveston, Tex., constituted in accordance with section 1 of the river and harbor act approved June 13, 1902, now has the honor to submit report.

The order convening the Board is as follows:

SPECIAL ORDERS, }	HEADQUARTERS, CORPS OF ENGINEERS, U. S. ARMY,
No. 19. }	<i>Washington, July 5, 1902.</i>

EXTRACT.

8. By authority of the Secretary of War, and in accordance with the provisions of the river and harbor act of June 13, 1902, a Board of officers of the Corps of Engineers, to consist of Lieut. Col. Henry M. Adams, Maj. George McC. Derby, Capt. William V. Judson, will assemble at Galveston, Tex., upon the call of the senior member, to make an examination and prepare plans and estimates for the protection of the port of Galveston and the property of the United States located on Galveston Island from excessive storms, by a breakwater or other means, and submit the same with a report upon the feasibility, advisability, and cost thereof, and the probable effect of such improvement upon the general condition of that port and its commerce.

The Board is authorized to visit such points as it deems necessary for the proper performance of its duties.

Upon the completion of the duty assigned them, the members of the Board will return to their proper stations.

The journeys required under this order are necessary for the public service.

By command of Brigadier-General Gillespie:

CHAS. S. BROMWELL,  
*Captain, Corps of Engineers.*

At the call of the senior member, the Board assembled at Galveston, Tex., at 2.06 p. m., December 8, 1902. After meetings on four successive days, during which the representatives of local interests were heard, inspections made of existing local conditions, and the problem before the Board fully discussed, the Board adjourned to meet at New Orleans on or about December 17, 1902. Meeting at New Orleans on December 18 and 19, 1902, the Board concluded its work.

Considering first the situation at the east end of Galveston Island, the Board is of opinion that any material obstruction to the flow of flood waters across the area between the sea arm of the south jetty and the

built-up portion of Galveston City would introduce conditions which, during a storm of conceivable character, might increase somewhat the danger to which the city would be exposed. It is further believed that the property of the United States at Fort Point, upon the area above described, will be sufficiently protected when the individual defensive works have been protected in the manner for which provision has already been made in pursuance of a project heretofore approved. Provision has likewise been made under the act approved June 13, 1902, for repairing and strengthening the shore arm of the south jetty and raising it to a height of 6 feet above mean low water. In case of a repetition of the hurricane of 1900, this height for the jetty would not be sufficient to prevent the passage of strong currents and waves across the jetty, and the channel lying behind it would probably be injured in much the same manner and to the same extent that it was in 1900. The Board is, however, of the opinion that it would be safer and more economical to repair such damage than at great expense to undertake to prevent it. The river and harbor act approved June 13, 1902, authorizes the Secretary of War to modify the plan for the south jetty so as to connect and adjust the same with the protection work proposed by the city of Galveston, and provided funds with which the work may be done. The Board is of the opinion, if the county of Galveston change the direction of the sea wall from the corner of Eighth street and Avenue D, so that it shall be extended in a northerly instead of a northwesterly direction, that the line of the south jetty should be diverted to connect with the sea wall. Upon sheet I is shown, dotted, the approximate line upon which the sea wall and jetty would then fall. The effect of these minor changes would be to extend protection to additional, but not undeveloped, wharf property.

Notwithstanding the fact that the Board recommends no work at the east end of Galveston Island under conditions as they now exist, it is possible that in the future local capital may be employed to extend the proposed sea wall hereinafter described from Sixth street in a northeasterly direction to the Fort Point Reservation belonging to the United States. It is not believed that such extension is necessary to the protection of any present developed interests at the port of Galveston; but if the work should be accomplished with the idea of utilizing areas and wharf front not now available, the Board expresses opinion that any element of danger introduced and heretofore referred to would be negligible when compared with the good that might result. Moreover, the Board believes that, if the sea wall and fill should ever be extended to the Fort Point Reservation, and if the title of the United States to that reservation be deemed perfect, then the United States might give favorable consideration to filling such reservation and to the necessary sea walls to protect it. As there seems so small a chance of conditions being modified at the east end by local expenditures of the nature described, the Board has included no plans or estimates for the Fort Point Reservation.

To protect the city proper against the destructive effects of excessive storms, the local authorities have already begun the construction of a substantial sea wall upon a line which is shown on Sheet I (tracing) inclosed herewith. The plans for the work embrace the following features:

(a) A reinforced concrete breakwater, upon pile foundation, over 3 miles in length, connecting with the south jetty near Eighth street;

thence to Sixth and D; thence across the island and down the beach as far as Thirty-ninth street. The top of this wall is to be 17 feet above mean low water, or 1.3 feet higher than the highest level ever reached by the water on Galveston Island during storms so far as known.

(b) The raising of the city grade to 8 feet at Avenue A, 10 feet at Broadway, 12 feet at Avenue P, and thence to the sea wall on a rising slope of about 1 foot in 1,500 feet.

(c) The making of an embankment on the fill and adjacent to the sea wall, rising to a height of 18 feet above low water at a distance of 200 feet from the wall, and thence sloping down to the surface of the fill on a grade of 1 in 50.

As the commercial usefulness of the port of Galveston is closely connected with the safety of the city as a place of business and residence, the Board has studied these plans and believes that the work projected would furnish adequate protection to property in the city of Galveston from the waves and currents of excessive storms.

Between Thirty-ninth street, the end of the proposed county sea wall, and Forty-fifth street, the latter forming the easterly bounds of the United States reservation upon which stands Fort Crockett, is a distance measured along the Gulf shore of about 2,475 feet. There is at present no need for a sea wall connecting Thirty-ninth and Forty-fifth streets unless there be danger of the cutting of a channel across Galveston Island, from Gulf to bay, in a strip normal to the Gulf and westward of the intersection of Thirty-ninth street with the Gulf beach. Inspection of the map will show that the strip above described is for the most part much lower than parts of Galveston Island lying adjacent to it. Situated in the strip is McKinney's Bayou, almost crossing the island. The Board has given consideration to this question, and believes that if the county sea wall be built as projected, and if the Fort Crockett Reservation be protected as hereinafter proposed, connection should be made between Thirty-ninth street and the Government reservation at Forty-fifth street by a sea wall of the character designed for the city front.

At Fort Crockett the United States possesses a reservation of about 80 acres, stretching along the beach a distance of 3,300 feet. Upon this area are three batteries of modern guns and mortars, designed to protect the city and port of Galveston from bombardment. This reservation, if properly filled and protected, would afford a safe location for the main garrison for all the defensive works at Galveston Harbor. The Board, therefore, recommends that a sea wall of the character already described be built from Forty-fifth street westwardly along the entire front of the Fort Crockett Reservation, omitting, however, those parts of the line where the protected fortifications already act as a breakwater. Upon Sheets II and III (tracings), inclosed herewith, are indicated, respectively, the approximate line suggested for the Fort Crockett breakwater, and a cross section of the wall above described and recommended for construction. In addition to constructing a sea wall in front of the Fort Crockett Reservation, it is recommended that this area be filled to a grade of approximately 15 feet at the sea wall, sloping thence backward at the rate of 1 foot in 1,500, thus conforming to the city grades; and that an embankment, similar to that proposed in front of the city, be constructed upon this fill adjacent to the sea wall.

In consideration of the fact that a sea wall between Thirty-ninth street and the westerly limits of the Fort Crockett Reservation would be of mutual advantage to the United States and to individual property owners of Galveston, it would seem proper that the local authorities should construct that part of the work lying to the east of the Government reservation. Moreover, inasmuch as the protection and filling of the Fort Crockett Reservation may be expected to add materially to the value of real estate situated on the land side of the reservation, and inasmuch as the United States may desire to acquire additional land in that vicinity for garrison purposes, it is recommended that any appropriation made for sea wall and filling at the Fort Crockett Reservation contain proviso authorizing the Secretary of War to withhold expenditure until favorable terms be offered the United States for such additional land as it may wish to acquire in rear of the proposed sea wall.

The Board is of the opinion that the danger of a channel forming across the island to the west of the Fort Crockett Reservation is remote and may be neglected, but believes that a provision should be made for a riprap revetment of the westerly bounds of the Fort Crockett Reservation, to protect the fill there proposed; and for a similar revetment of the easterly bounds, pending the construction of a sea wall between Thirty-ninth and Forty-fifth streets.

The question of fill behind the sea wall between Thirty-ninth and Forty-fifth streets has been considered, and such fill is not believed to be immediately necessary, beyond the construction of an embankment similar to that proposed for the city front. The line of the wall here should be retired somewhat from the beach, so as to utilize the sand in front as an efficient protection for the wall against ordinary storms, and as some protection even against storms of exceptional severity.

In view of the exposure of the wharf front and shipping to wind and wave action when, in a tropical storm, after banking up the water in Galveston Bay, the wind whips around to the north, the Board has considered the need for a protecting structure upon the north bank of Galveston channel. Upon a map already printed and forming a part of House Document No. 264, Fifty-sixth Congress, second session, to which attention is respectfully invited, is shown clearly the situation opposite the wharf front. Covering the entire north exposure lie certain flats known as Pelican Island and Pelican Spit, the distance between the wharf front and the 3-foot contour of the flats at the west end of the former being about 11,000 feet, decreasing to about 2,000 feet at the east end of the wharf front. In the river and harbor act approved June, 13, 1902, a project was adopted to widen and deepen Galveston channel, and this project involves the partial filling of the shoal areas lying between the wharf front and Pelican Island and Spit. It is probable that the completion of this project will be followed by some utilization of the areas referred to for city and wharf purposes. If this be true, the barrier already formed by the flats will be increased materially, and it would seem inadvisable to construct a sea wall upon the north bank of Galveston channel. The Board, therefore, does not recommend any protective work in this locality beyond that contemplated in projects heretofore approved.

To summarize: The work provided for by the county of Galveston is a sea wall extending from the foot of the South Jetty to Thirty-



ninth street, the construction of an embankment behind the sea wall, and the raising of the city grades as previously described. This work has already been undertaken by local authorities upon plans which this Board believes to be adequate.

This work has been estimated to cost as follows:

Sea wall, 17,700 linear feet, at \$66.50 .....	\$1, 177, 050
Fill, 13,873,000 cubic yards, at 10 cents .....	1, 387, 300
Fill, 3,262,000 cubic yards, at 15 cents .....	489, 300
Paving and soiling, 17,700 linear feet, at \$7.50 .....	132, 750
	<hr/>
	3, 186, 400
Add for engineering and contingencies 10 per cent. ....	318, 640
Total .....	<hr/>
	3, 505, 040

In addition to the work already undertaken by the city and county of Galveston, the Board considers the following work to be feasible and advisable:

(a) The construction of a sea wall and embankment between Thirty-ninth street and Forty-fifth street. The estimate for this work is as follows:

2,475 linear feet of sea wall, at \$66.50 .....	\$164, 587. 50
700,000 cubic yards of fill, at 18 cents .....	126, 000. 00
2,475 linear feet of paving and soiling, at \$7.50 .....	18, 562. 50
Engineering and contingencies .....	30, 850. 00
	<hr/>
Total .....	340, 000. 00

It is believed that this expense should be borne entirely by the local authorities.

(b) The construction of a sea wall along the front of the Fort Crockett Reservation, and the filling of the latter. The estimate for this work is as follows:

2,380 linear feet of sea wall, at \$66.50 .....	\$158, 270
1,000,000 cubic yards of fill, at 18 cents .....	180, 000
2,380 linear feet of paving and soiling, at \$7.50 .....	17, 850
5,700 cubic yards of riprap revetment in place, at \$2.50 .....	14, 250
Engineering and contingencies .....	39, 630
	<hr/>
Total .....	410, 000

The effect of all the work above outlined upon the general condition of the port of Galveston and upon its commerce is difficult of exact determination. On the one hand there enters into the problem the probability of the recurrence of storms as destructive as that of 1900 and on the other hand there enters the moral effect of increased confidence inspired by a substantial sea wall, for it is perhaps true that capitalists to-day unduly hesitate to create on Galveston Island the facilities for a great commerce, without which facilities there can not be the economic handling and dispatch of the products naturally tributary to the port. In one sense the expenditures of a protective nature are insurance against the real chances of another catastrophe; in another sense they are required for moral, but no less urgent, reasons to reassure the minds of those who are now deterred from making investments or establishing residence at the port of Galveston. Protective works are essential in connection with the creation and maintenance of economic plants at Galveston for handling the vast quantities of grain, cotton, and other products there seeking export.

The effect of the port of Galveston upon the movement of grain to the sea from a large area covering Texas, Oklahoma, Indian Territory, Kansas, Nebraska, etc., is to bring into competition additional interior lines of transportation, and thus to reduce rates to all ports. The Board is unable to estimate with exactness the consequent saving to producers, or even to indicate the geographical limits of the effect, but invites attention to the following:

[Extract from the report of the Industrial Commission, pp. 123-124, Vol. VI.]

\* \* \* But there is another factor of freer competition among the south-bound railroads than the Eastern trunk lines openly allow—a competition which has at times reduced rates from Kansas, Nebraska, and Missouri to the Gulf to a figure as low as the rate from these States to Chicago. \* \* \* Within very recent years the winter-wheat center has shifted southwestward toward the ports on the Gulf of Mexico and away from the Lake ports. \* \* \* Formerly, when the season of navigation closed on the Erie Canal, the rail rates rose, and fell again with the opening of the season. Water competition through the Gulf ports, coupled with the railway competition reaching the Gulf, has robbed the trunk lines of even this advantage. Prior to the opening of the Gulf ports in 1889 the corn rate on Eastern trunk lines was advanced to 25 cents upon the close of navigation. Within the last five years the southward competition has become so effective as to prevent this advance entirely. The result of Gulf competition has therefore led to a lower rate, and also to a more regular rate throughout the entire year.

[Extracts from evidence given before the Interstate Commerce Commission at Chicago, Ill., November 8, 1901.]

The CHAIRMAN. It appears from statements made here that the relative exportation through the Gulf port has greatly increased. \* \* \* How do you account for that?

Mr. BIDDLE (representing Atchison, Topeka and Santa Fe Railroad). The fact of the increase of the production of wheat in the territory tributary to the Gulf ports. The center of the territory on our line is about equally distant from Chicago and Galveston, and when the grain gets to Chicago it is as far from the seaport as it is at the point where it originated on our line from Galveston.

The CHAIRMAN. The fact that there is such a large movement through the Gulf ports would indicate that the through rate to foreign destinations from the area of production is less by the Gulf than by the Atlantic ports?

Mr. BIDDLE. I would not think so. I would consider it to the interest of the lines on which the grain was raised to adjust the rates so as to naturally move it. I expect to see the day when practically all the grain raised on our line will move out by Gulf ports.

\* \* \* \* \*  
The CHAIRMAN. Is the relation in rates from that territory of production to the Atlantic ports or Gulf ports substantially the same now that it has been in previous years, or is the rate to the Gulf ports relatively less?

Mr. BIDDLE. No; it is not less to the Gulf ports. That is, there has been no reduction made in the rates to the Gulf ports. If there has been any reduction it has been in rates to the Atlantic ports in the attempt to move the business out that way.

\* \* \* \* \*  
Commissioner PROUTY. Why, in fact, do you not carry flour that way?

Mr. BIDDLE. One reason has been that there has not been the equipment for handling by way of Galveston. There is a question of insurance and larger tramp lines, and the question of insurance cuts a large figure in those lines.

[Extracts from evidence given before the Interstate Commerce Commission at Washington, D. C., January 29, 1902.]

Mr. PAUL MORTON (representing Atchison, Topeka and Santa Fe Railroad). \* \* \* We found it necessary in order to hold our fair share of the business at competitive stations—that is to say, to retain to our own company a fair proportion of the business that originated on our lines—to make an arrangement with somebody, and we made one with Richardson & Co. Probably 80 per cent of the business they handle is export, and it is handled as much as possible to the port of

Galveston. Galveston is 750 miles from the wheat fields of Kansas. Chicago is about the same distance. At Galveston we are at tide water, and the grain that goes there is loaded onto ocean vessels. At Chicago we are 1,000 miles from tide water, and yet there has been a constant pressure, a constant effort on the part of the lines leading east from Kansas City—I mean the lines terminating at Kansas City and their connections to New York, Boston, Montreal, Newport News, Baltimore, and other Atlantic seaports—to bring the grain this way, and the rates have not been published, and the business has been a contest. \* \* \* The railroad that will make the lowest rate from Kansas City to Chicago or St. Louis, or to any other market—Minneapolis, if you please—gets the business. \* \* \* I do not know any place in the United States that has such discrimination in its favor as a grain market as Kansas City. The rates are never maintained east bound out of there for any length of time, and in the experience I have had there in the last six years, the price of grain at Kansas City was a great deal higher than the price in Chicago or any other market, figuring on the regular rate of freight.

\* \* \* We know what the rates are \* \* \* to Chicago on wheat \* \* \* from Kansas City. While it was 10 cents, or sometimes 12 cents, the business would not move at 7; somebody was hauling it at 6.

\* \* \* Commissioner PROUTY. What has been the prevailing rate from Kansas City to Galveston the last year?

Mr. MORRIS. It has been all the way from 10 to 12 and 15 cents.

During the fiscal year ending June 30, 1900, there was exported from the United States to foreign countries a total of 311,298,673 bushels of wheat and corn, of which 21,656,630 bushels, or about 7 per cent, was exported by way of Galveston. When it is considered that 9 per cent of the population of the United States in Kansas, Nebraska, Colorado, Texas, Indian Territory, and Oklahoma raised on an average 25 per cent of the corn and wheat crops of 1898-99 it is readily understood that a relatively large percentage of the grain raised in the territory influenced by Galveston is surplus, and must be moved to a distant market. The average of the corn and wheat crops in that territory for 1898 and 1899 was approximately 667,134,027 bushels. It is not too much to say that the existence of the port of Galveston, influencing freight rates paid on grain moved east from Kansas City, and lowering directly the cost of marketing grain raised south and west of that point, places in the hands of the producers of the great region under consideration at least 1 cent for each bushel raised, or say \$6,000,000 per annum.

Considering the cotton crop of Texas alone, some study has convinced the Board that a low estimate of the saving to producers in Texas alone, due to the existence of a deep-water port at Galveston, is 66½ cents per bale, or about \$2,000,000 per annum.

Taking into account the cotton-seed products, coal, ore, lumber, and general merchandise, as well as the special products above mentioned, it is believed that a conservative estimate of the value of the country of the present improved port at Galveston is more than \$10,000,000 per annum. The latter sum certainly represents a minimum of what would be lost annually to the community if Galveston ceased to exist to-day as a deep-water port. Moreover, the construction of protective works at Galveston may reasonably be expected to increase confidence and induce the installation of plant to handle other freights, such as cattle, meats, and flour; to lead to the cheaper handling of products now exported; to reduce insurance and ocean freight rates; and to attract other railroads to Galveston, thus tending to increase the competition among interior lines and widen the beneficial influence of this valuable port.

Attention is invited to the following inclosures, which treat especially of the commerce of the port:

- (1) A letter addressed to this Board by a committee of citizens of Galveston, Tex.
- (2) A letter addressed to Col. Walter Gresham by Mr. J. H. Johnston, Secretary Galveston Chamber of Commerce.

Respectfully submitted.

H. M. ADAMS,  
*Lieut. Col., Corps of Engineers.*

G. MCC. DERBY,  
*Major, Corps of Engineers.*

W. V. JUDSON,  
*Captain, Corps of Engineers.*

Brig. Gen. G. L. GILLESPIE,  
*Chief of Engineers, U. S. A.*

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[Inclosure No. 1.]

LETTER OF A COMMITTEE OF CITIZENS OF GALVESTON, TEX.

GALVESTON, TEX., *December 12, 1902.*

GENTLEMEN: After the storm of September 8, 1900, the citizens of Galveston realized the necessity of protecting this port and at once commenced a systematic effort to accomplish that result. The legislature of Texas, which convened in January, 1901, provided for the appointment of a board of three skilled engineers to devise plans for the protection of the city against calamitous overflows. This board, composed of Gen. H. M. Robert, Alfred Noble, and H. C. Ripley, recommended the construction of a sea wall along the Gulf front and the filling and grading of the city from the Gulf to the Bay. Their estimates were, for building the sea wall, \$1,500,000, and for filling the city, \$2,750,000, making a total of \$4,250,000. This report, with the plans and estimates, are in your possession. The legislature passed a bill authorizing the county of Galveston to issue \$1,500,000 in bonds to be sold at not less than par and the proceeds used for constructing a sea wall. These bonds have been issued and sold and the contract let for the completion of the work.

The legislature also donated to the city of Galveston the State revenue taxes collected from persons and upon property in the city of Galveston for a period of three years ending September 1, 1903. We will apply to the next legislature for an extension of this donation for an additional period of fifteen years. The Democratic State convention has indorsed the proposition for a donation of the State taxes collected in Galveston County for the period of fifteen years from September 1, 1903, and many of the districts of the State have instructed their representatives to vote for the measure. We therefore feel confident of securing the donation of the State taxes for an additional period of fifteen years. The money received from the State taxes, estimated at \$2,000,000, is to be used exclusively for filling and grading the city. This, supplemented by what the city may be able to raise from a sale of bonds, will, we believe, secure the funds necessary to fill and grade the city in accordance with the plans of the Board of Engineers.

The Federal Government, with a view of protecting the port of Galveston, has constructed three forts, two of which are in the city limits, Fort San Jacinto on the east end of the city upon a tract of land containing approximately 640 acres, and Fort Crockett, located upon a tract of land in the western suburbs of the city, containing about 100 acres.

These forts, and the lands surrounding them, are owned by the Government and should in our opinion be protected by it in accordance with the plan adopted for the protection of the city of Galveston or by better plans if this board should so decide. The importance of these forts from a military point of view and the advisability of providing safe and suitable quarters for officers and men are fully understood and appreciated by you. We believe it has always been the policy of the Federal Government, when it owns property within the corporate limits of a city and plans for

the improvement of that city have been adopted and are being carried out, to improve its property in conformity with the plans adopted by the city. The Government might protect and utilize its property within the limits of our city by the construction of works less expensive than those proposed by the city, but the effect of such improvements, while answering the Government's purposes might tend to mar the plan contemplated by the city, if not actually to prevent its extension. We believe it to be the policy of the Government, instead of restricting the work we have undertaken, to lend a helping hand to carry the same to a successful completion, even though it might cost the Government thereby a larger sum of money for improving and protecting its property than would otherwise be required.

The provisions of the act under which this board is acting are as follows:

The Secretary of War is hereby authorized and directed to appoint a board of engineers to make an examination and prepare plans and estimates for the protection of the port of Galveston and the property of the United States located on Galveston Island from excessive storms, by a breakwater or other means, and submit the same with a report upon the feasibility, advisability, and cost thereof, and the probable effect of such improvement upon the general condition of that port and its commerce, and the expenses of said board shall be paid from the foregoing appropriation.

The first part of this clause directs an examination and the preparation of plans and estimates, not only for the protection of the Government's property located upon Galveston Island, but also for the protection of the port of Galveston. This, we think, includes not only the harbor and all the Government works in connection therewith, but the city with its wharves and terminal facilities. This construction is borne out by the last provision of the clause which requires a report upon the probable effect of such improvements as this board may recommend "upon the general condition of that port and its commerce."

That Congress had in contemplation the improvement of the Government's property and the protection of this port by works at least equal in efficiency to those adopted by the city seems clear when the provision above quoted is considered in connection with the other provisions of the act relating to the improvement of this port. The widening and deepening of the channel in front of the city at a cost of \$1,650,000 and the repair of the jetties at an additional cost of \$1,500,000, with authority to the Secretary of War "to modify the plan for the south jetty so as to connect and adjust the same with the protection work proposed by the city of Galveston, if found advisable," shows that the Government intends to improve, protect, and develop this port upon plans commensurate with its commercial importance and expectancies. Such plans will, we hope, be prepared and recommended by your board. The successful improvement of this harbor is one of the great engineering achievements of the age, and its effect upon the commercial interests of the country has been phenomenal. No harbor work undertaken by the Government has been more successful or produced in so short a time such beneficial results, but unless the port is protected and confidence in the safety of the city is reestablished trade will ultimately seek other channels and the full benefit of a deep-water harbor will not be realized. The following are some facts showing the importance of this port to which we desire to call your attention:

First. Galveston is geographically the nearest port to the section of country that raises one-third of the cotton and one-third of the wheat produced in the United States. All export rates from this section of the country are regulated by the rates through this port, and its protection and improvement will inure to the benefit of all the country west of the Missouri River.

Second. The rates from the Atlantic seaboard, via Galveston, to the Pacific Ocean regulate all transcontinental freight charges. Any reduction in the cost of transportation through this port is and must be met by other transcontinental lines.

Third. The railway systems having ocean termini here control and operate 35,760 miles of railroad, as follows:

	Miles.
Harriman System .....	12,601
Gould System .....	12,020
Santa Fe System .....	8,584
M., K. & T. System .....	2,555

The Rock Island System, which is now building to Galveston, has about 7,000 miles of railroad. All of these lines traverse a productive territory that is as yet only partially developed.

Fourth. The ocean rates from this port, since the securing of deep water, have been greatly reduced. There is now an annual saving over what was paid before this harbor was improved, say in 1890, upon cotton, cotton-seed products, grain and grain

products exported from the territory tributary to this port, say for the year 1900, the sum of \$13,931,131, the items of which are as follows:

Cotton.....	\$3, 875, 000
Cotton-seed products.....	951, 560
Grain and grain products.....	9, 104, 571

Fifth. The export business of the port amounted, during the calendar year 1901, to \$106,526,508. The increase for the year 1902 will exceed 10 per cent, or be \$117,179,158, which makes this the fourth exporting port in the United States.

Sixth. The city of Galveston and its business institutions have expended, in trying to improve this harbor, over \$1,000,000, and in providing port facilities in aid of commerce, over \$7,000,000.

In reply to your questions in regard to the Government's title to the 640 acres of land upon which Fort San Jacinto is located, we desire to state that the Attorney-General of the United States has pronounced the Government's title perfect. This property is, however, covered by what is known as the "Big Foot Wallace survey," and is claimed by private parties under a grant from the State of Texas. We presume the Government, having constructed a fort upon the property, and its chief law officer having approved its title, the other Departments of the Government will not consider any adverse claim. Should you conclude to refer to the title in your report, then we would ask that your recommendations be based—first, upon the Government's title as it is; second, upon a title that may be secured by us from the present claimants.

Acting upon the suggestion made by a member of your board during the investigation, we submit the following as the points upon which we would like you to report:

First. Your conclusions as to the effect of the works that have been constructed, and those that are in course or contemplation of construction by the Federal, State, and municipal governments in protecting the port against calamitous overflows. This includes the jetties, the widening and deepening of the channel in front of the city, the sea wall now being constructed by the county, and the filling and grading of the city by the State.

Second. A plan for and the cost of a breakwater extending from a point of intersection with the county's sea wall near Sixth street and Broadway, in a northeasterly direction in front of Fort San Jacinto to the south jetty. The protection such breakwater and filling would afford the Government's property, the harbor, and the city; also the value, from a military standpoint, of the 640 acres of land when thus protected and filled, and the commercial value of the west 160 acres of this property when protected and filled as you may suggest.

Third. Plans with the estimated cost for protecting and filling the Government's property at Fort Crockett in conformity with the plans adopted by the city.

Fourth. If the improvements mentioned in the foregoing second and third paragraphs, or any part of them, are recommended, what portion of the cost thereof should be paid by the city?

Fifth. The probable effect of such improvements as you may recommend upon the general conditions of the port and the increase of its commerce.

In conclusion we beg to suggest that, in view of the expenditure made by the Government in improving the harbor and building forts for the protection of the port against a foreign enemy, the vast annual saving to the people of this country in reduced freight rates, and the large sums of money expended here by private parties in furnishing facilities in aid of commerce, that the expenses of extending the sea-wall and filling the Government's property should be borne by the Federal Government. To handle economically the commerce of a port, people are as essential as deep water, and, under the conditions existing here, we think it is the duty of the Government not only to protect its property, but also to aid in the protection of the lives and property of its citizens who may reside here.

Respectfully submitted.

R. WAVERLY SMITH,  
*Chairman Galveston Deep-Water Commission.*

B. ADOUE,  
*President Galveston Maritime Association.*

JULIUS RUNGE,  
*President Galveston Cotton Exchange and Board of Trade.*

CHAS. FOWLER,  
*Vice-President Chamber of Commerce.*

Lieut. Col. H. M. ADAMS, Maj. G. McC. DERBY, Capt. W. V. JUDSON,  
*New Orleans, La.*

[Inclosure No. 2.]

## LETTER OF THE GALVESTON (TEX.) CHAMBER OF COMMERCE—EFFECT OF DEEP WATER ON COMMERCE THROUGH GALVESTON.

GALVESTON CHAMBER OF COMMERCE,  
*Galveston, Tex., December 12, 1902.*

MY DEAR COLONEL: As I advised you verbally, it is the hardest thing in the world to make thus hastily an accurate estimate in dollars and cents which the securing of deep water at this port has had on the traffic moving through Galveston. The effect has been so far reaching that the longer we consider it the more incomprehensible the total grows.

In a general way, it may be said that the increased carrying capacity and superior character of the vessels have now reduced largely the items formerly paid for insurance, pilotage, dockage, and various other port expenses, to say nothing of the entire elimination of lighterage charges. Without specification, it also goes without saying that the rates on all classes of merchandise moving to and from Texas, Indian Territory, Oklahoma Territory, Missouri River, Kansas, Colorado, Utah, New Mexico, Arizona, and California have been very materially reduced. Rates between Atlantic seaboard and all of above territory were formerly made lowest combination of locals through Mississippi River crossings, but now the bulk of the freight, including vast quantities of sugar from New York even to Missouri River points, is handled through Galveston at lower rates than those applying via all rail and other water and rail routes. Indeed, the rates from Atlantic seaboard to California are now precisely the same as those applying from Chicago, while formerly there was quite a difference in favor of the more westerly territory.

However, if we can not give any adequate idea of the entire saving on this account, we may be able to fairly approximate it on a few of our staple commodities, such as cotton, cotton-seed products, grain, and grain products.

*Cotton.*—The average crop of Texas and Indian and Oklahoma Territories, for the past four seasons, was 3,235,000 bales, but for our purposes let us call it 3,000,000 bales, distributed as follows: To domestic spinning points in Atlantic seaboard, 500,000 bales; to foreign points, 2,500,000 bales. The reduction in rates on domestic shipments since 1890 amounts to 5 cents per 100 pounds or 25 cents per bale on 500,000 bales—equals \$125,000. The rate reduction on foreign cotton amounts to 10 cents per 100 pounds inland, and 20 cents per 100 pounds ocean, or total of \$1.50 per bale of 500 pounds, equal to \$3,750,000 on 2,500,000 bales.

*Cotton-seed products.*—Approximating 250,000 tons as the average annual exportation of cotton-seed meal and cake from Texas, with a saving in inland rate of \$1.30 per ton, and in the ocean rate of \$2 per ton since 1890, we get a total saving of \$3.30 per ton on 250,000 tons—equals \$825,000. Approximating 33,750 tons of cotton-seed oil as the average annual export from Texas, at a saving of \$1.75 per ton in the inland rate and \$2 per ton on the ocean rate, we get a saving of \$3.75 per ton on 33,750 tons—equals \$126,560.

*Grain and grain products.*—It is very difficult to give any adequate idea of the benefit which this port has been to the producer of grain and grain products, for the reason that it is so hard to determine, on short notice, the amount of such grain and grain products which has been exported through other ports.

In Kansas alone the wheat production in year 1900 was 82,488,655 bushels, while the consumption of that State was but 6,617,227 bushels, leaving a surplus for shipment of 75,871,428 bushels. In 1901 the wheat production of Kansas was 99,079,304 bushels, consumption 6,639,066 bushels, leaving a surplus for shipment of 92,440,238 bushels.

Let us take the year 1900 as an average for our purpose. Texas as well as Indian and Oklahoma Territories also had a surplus of wheat in that year; and, whether the entire surplus of Kansas moved through Galveston or not, it is quite certain that the rates applying via this port fixed the price which the farmer secured for his wheat, and to that extent benefited the producer. A very conservative estimate would place the saving in the inland rate from Kansas at 10 cents per 100 pounds, and in the ocean rate from Galveston an equal figure, making a total of 20 cents per 100 pounds, or 12 cents per bushel on 75,871,428 bushels, equals \$9,104,571; this on Kansas wheat alone, to say nothing about the wheat, corn, and flour from other States and Territories tributary to Galveston.

Conservative people estimate that when this port finally gets what is its due in the way of grain shipments, we will export via Galveston not less than 100,000,000 bushels of wheat and 100,000,000 bushels of corn annually.

It will thus be seen that the saving to the farmers of the territory west of the Mississippi River in one year is infinitely more than the entire expenditure of the Federal Government for the purpose of securing and maintaining a deep-water harbor at Galveston.

For your information along this line, I send you herewith extracts from the Galveston News trade edition of September 1, 1902, showing the exports and imports via Galveston. You will notice that while we are fourth in the matter of exports, we rank only thirty-fourth in the matter of imports. However, even in the latter we are gaining right along, and while it will be many years before we hold as high a rank on imports as on exports, still the fact that we now have first-class regular liners from nearly all important European ports, with stated sailing dates, is bound to have its effect in the turning of inbound cargo via this port instead of via Atlantic ports and New Orleans, as heretofore. The ships coming here can bring return cargoes for almost the same rates as are paid to Atlantic ports, and as the inland rates are so much less from here it is confidently expected to favorably and radically influence the situation within the next few years.

For your further information I give you below the mileage of the various railroad systems now entering Galveston.

*Harriman system.*

	Miles.
Southern Pacific, including Houston and Texas Central.....	8, 774
Houston East and West Texas.....	192
San Antonio and Aransas Pass.....	687
	<hr/>
	9, 653
Union Pacific.....	2, 949
	<hr/>
Total.....	12, 601

*Gould system.*

Missouri Pacific and Iron Mountain.....	5, 651
International and Great Northern.....	1, 001
Denver and Rio Grande.....	1, 708
Rio Grande Western.....	670
Texas and Pacific.....	1, 688
St. Louis Southwestern.....	1, 302
	<hr/>
Total.....	12, 020

*Santa Fe system.*

Santa Fe.....	8, 584
---------------	--------

*Missouri, Kansas and Texas system.*

Missouri, Kansas and Texas.....	2, 555
---------------------------------	--------

*Rock Island system.*

Rock Island.....	5, 780
Choctaw, Oklahoma and Gulf.....	1, 171
To Galveston.....	290
	<hr/>
Total.....	7, 241

The Rock Island is not yet a Galveston line, but contracts have been let for the construction of the road from Dallas to this port, and I inclose a clipping, taken from McClure's Magazine, showing that they, even now, advertise this port as their chief outlet. Note particularly the figures they give regarding the wheat, corn, cotton, gold, and silver produced in the section of the United States tributary to the Rock Island system.

I trust this brief outline may be of some service to you in presenting the matter in its true light.

Respectfully, yours,

J. H. JOHNSTON, *Secretary.*

Col. WALTER GRESHAM,  
*Deep-Water Committee, Galveston, Tex.*



REPORT OF CAPT. C. S. RICHÉ, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,  
*Galveston, Tex., June 5, 1903.*

GENERAL: I have the honor to acknowledge the receipt of letter of the 19th ultimo regarding deflection of shore end of Galveston south jetty to meet the Galveston sea wall.

Before the receipt of this letter the matter had been taken up by those interested, with the following results:

The Gulf, Colorado and Santa Fe Railroad owns the property east of the existing wharf front, and the protection of this property would be increased by the proposed change in alignment.

This road proposed substantially to bear all the increased cost consequent upon deflecting the sea wall, i. e., if the same length of sea wall were to be built on the new alignment as on the old, this road to bear all increased cost over what would result from this change of location.

This with the understanding that the Government would construct a branch jetty from the present south jetty to meet the deflected sea wall, and this construction I informed the commissioners I would recommend were the sea wall so deflected.

I also proposed in this case to request the Gulf, Colorado and Santa Fe Railroad Company to donate to the Government any additional right of way needed for this new branch of the jetty, and also that present reversionary clauses in right of way across their land for present jetty should be revoked.

A majority of the commissioners, however, were opposed to changing the alignment of the sea wall and it will not be deflected. Attention is invited to inclosed copy of letter on the subject from Judge Fisher.

Failing this deflection of the sea wall, I do not believe there will be any advantage, commensurate with the cost, in constructing a branch of the jetty on the alignment indicated by broken line on the blue print returned herewith.

First. It would cost about \$50,000.

Second. It would be no higher than existing jetty (when repaired), i. e., 6 feet above mean low tide, and would hardly be of much use as a deflector of currents when storms raised the waters higher than 6 feet, as would have been the case for about half of the proposed new alignment had the sea wall been deflected.

The throwing out of a branch jetty along the proposed new line, with the sea wall kept on its original alignment, would somewhat reenforce the narrow or weak part of Galveston Island, but in no such way as would the deflected sea wall with a branch jetty meeting it. The sea wall being high (17 feet above mean low tide) would tend to turn dangerous currents away from the east end of the wharf front during storms when the water was over the top of the jetty, when a low structure like the branch jetty would not.

In view of the above conditions, therefore, it is recommended that no further action be taken in this matter by the United States.

Very respectfully, your obedient servant,

C. S. RICHÉ,  
*Captain, Corps of Engineers.*

Brig. Gen. G. L. GILLESPIE,  
*Chief of Engineers, U. S. A.*  
(Through the Division Engineer.)

[First indorsement.]

OFFICE DIVISION ENGINEER, GULF DIVISION,  
*New Orleans, La., June 17, 1903.*

Respectfully forwarded to the Chief of Engineers, U. S. Army.

In view of the conditions stated within by Captain Riché, it is recommended that no further action in this matter be taken by the United States at present.

H. M. ADAMS,  
*Lieut. Col., Corps of Engineers,  
Division Engineer.*

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LETTER FROM MR. LEWIS FISHER, COUNTY JUDGE, GALVESTON COUNTY, TEXAS.

COUNTY COURT, GALVESTON COUNTY, TEX.,  
*Galveston, Tex., June 1, 1903.*

DEAR SIR: Your letter of May 28, with inclosures and blue print, referring to the matter of the deflection of the Galveston sea wall, is before me.

I have no idea that the matter will ever be discussed again in the commissioners' court with any probability of a change being made in the present course of the wall.

You suggest in your letter that you would like to have in writing the sense of the commissioners on the subject. Personally, I was heartily in favor of the proposed change in the wall, and so expressed myself at the meeting when the matter was under discussion. Mr. Henderson was also in favor of the proposed change, while Commissioners Dick, Menard, and Wolston were opposed to it, and, being a majority, their opposition prevailed.

I note carefully the contents of Colonel Mackenzie's letter to you, and also the excerpts from the appropriation bill. In view of the information contained in these inclosures, I regret very much the commissioners could not see their way clear to vote for the proposed change, as I believe that the Government, as well as the people of Galveston, would have been greatly benefited thereby.

Kindly accept my thanks for the many courtesies extended in this matter.

Yours, very truly,

LEWIS FISHER,  
*County Judge, Galveston County, Tex.*

Capt. C. S. RICHÉ,  
*Galveston, Tex.*



## APPENDIX X.

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### IMPROVEMENT OF CERTAIN RIVERS AND WATERWAYS IN LOUISIANA, TEXAS, ARKANSAS, INDIAN TERRITORY, AND MISSISSIPPI TRIBUTARY TO MISSISSIPPI RIVER.

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REPORT FOR THE FISCAL YEAR ENDING JUNE 30, 1903, WITH OTHER DOCUMENTS RELATING TO THE WORKS. OFFICERS IN CHARGE: CAPT. CHAS. L. POTTER AND CAPT. CHAS. S. BROMWELL, CORPS OF ENGINEERS.

#### IMPROVEMENTS.

- |   |   |
|---|---|
| <ol style="list-style-type: none"><li>1. Red River, Louisiana, Arkansas, Texas, and Indian Territory.</li><li>2. Cypress Bayou, Texas and Louisiana.</li><li>3. Ouachita and Black rivers, Arkansas and Louisiana.</li><li>4. Bayou Bartholomew, Boeuf River, Tensas River, and Bayou Maçon, and Bayous D'Arbonne and Corney, Louisiana and Arkansas.</li></ol> | <ol style="list-style-type: none"><li>5. Mouth of Yazoo River and harbor at Vicksburg, Mississippi.</li><li>6. Yazoo, Tallahatchie, and Big Sunflower rivers, and Tchula Lake, Mississippi.</li></ol> |
|---|---|
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UNITED STATES ENGINEER OFFICE,  
*Vicksburg, Miss., July 17, 1903.*

GENERAL: I have the honor to transmit herewith annual reports for the fiscal year ending June 30, 1903, upon the works of river and harbor improvement of the Vicksburg, Miss., district.

This district was in the charge of Capt. Charles L. Potter, Corps of Engineers, until June 5, 1903, when I assumed charge pursuant to Special Orders, No. 83, paragraph 27, dated Headquarters of the Army, Adjutant-General's Office, Washington, April 9, 1903.

Very respectfully, your obedient servant,

CHAS. S. BROMWELL,  
*Captain, Corps of Engineers.*

Brig. Gen. G. L. GILLESPIE,  
*Chief of Engineers, U. S. A.*

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#### X 1.

### IMPROVEMENT OF RED RIVER, LOUISIANA, ARKANSAS, TEXAS, AND INDIAN TERRITORY.

#### GENERAL IMPROVEMENT.

The U. S. snag boat *C. W. Howell* was employed almost continuously during the year, and its operations extended over the river

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between Montgomery, La., and Fulton, Ark., 340.8 miles, and above Fulton to the mouth of Kiamichi River, Indian Territory, about 170 miles. The boat was in command of Watkins Decker, except during a short period of illness, May 5 to 31, 1903, when James H. Britton was temporarily in charge.

The following is a summary of the work performed:

*Between Fulton, Ark., and Montgomery, La.*

Snags pulled.....	829
Stumps pulled, cut, and destroyed.....	93
Shore snags cut.....	240
Logs removed from channel.....	33
Side jams broken up and destroyed.....	17
Leaning trees felled.....	2, 829
Trees girdled.....	284
Square yards of willows and brush cut.....	160

*Above Fulton, Ark.*

[December 16, 1902, to April 1, 1903.]

Snags pulled, cut, and destroyed.....	203
Stump pulled.....	1
Shore snags cut.....	237
Jams broken up and destroyed.....	2
Side jams broken up and destroyed.....	7
Leaning trees felled.....	225

AT SHREVEPORT, LA.

September 25, 1902, Captain Potter submitted a project for improving the channel at Shreveport, La., by the construction of four deflecting and silt-forming pile dikes, having a total length of about 1,866 feet (764 feet on shore or batture and 1,102 in the water), for the purpose of scouring the bar formation and restoring the channel to its former location through the draw span of the bridge. The project contained the following information respecting the locality:

The bar formation along the left bank of Red River, opposite Shreveport, is due to the following causes: The current of Cross Bayou formerly forced the flow of Red River toward the Bossier or left shore, through the draw opening of the bridge, but as the work for the improvement of Upper Red River progressed by deepening the channel, closing outlets, and leveeing the right bank, the supply of water that formerly came out of Cross Bayou from the lake region to the westward of Shreveport became less and less until finally it was limited to the natural drainage, except at flood stages of Red River. There have been no very high stages of Red River since 1895, and in 1897 the mouth of Cross Bayou, which was closing from natural causes, was embanked to provide water for the city of Shreveport. The water supply became so limited, however, that, with the assent of Congress, the Shreveport Water Works Company built a low dam across Twelve-mile Bayou and deepened and widened Blind Bayou, a small stream immediately above the dam, for the purpose of delivering water from Twelve-mile Bayou into Cross Bayou, free from the influence of Red River at stages lower than the crest of the dam. The recent survey shows that the partial deflection of Twelve-mile Bayou into Cross Bayou had no appreciable effect upon the conditions in Red River at and below the mouth of Cross Bayou.

As Red River practically is cut in two by the Shreveport bar, it is my opinion that prompt measures are required in the interest of navigation to restore and maintain through traffic, and I consider the work of sufficient importance to warrant an additional allotment from the funds available for "general improvement" of Red River, in case the unexpended balance of the allotment for work at Shreveport (\$14,432.30) should prove insufficient.

The project was approved by the Secretary of War October 2; the work was advertised October 9, and bids were opened November 1, 1902. But two bids were received, viz:

1. Hunter & Frey, Memphis, Tenn.....	\$20,362.00
2. Grigsby Construction Co., Shreveport, La.....	35,588.25

The bid of Hunter & Frey was accepted, and an additional allotment of \$7,000 for the work, by transfer from funds for "general improvement," was authorized. Contract was entered into November 13, and approved by the Chief of Engineers December 4, 1902, requiring that work begin by December 20, 1902, and be completed by February 15, 1903, which ordinarily is a comparatively low-water period. Before the contractors could begin work, however, the river rose rapidly to the highest point reached since April, 1894 (34.1 feet December 15 and 16, 1902), and they were delayed by the flood until January 5, 1903, when it had receded considerably. In January 1,536 linear feet of piles were driven by the contractors for the construction of Dike No. 1; but the bar formation cut away from around the piles rapidly, and it appeared to be advisable to suspend work until low water. The flood caused radical changes in the river bed, building up the bar in front of Shreveport, and scouring out the channel and throwing it toward the bar at its upper end, so that at locations where it was planned to build dikes in about 12 feet of water at zero of the gauge there was a depth of 40 feet. The bar on the Shreveport side, across which it had been proposed to build dikes to a height of 22 feet above low water, and which would have given them a height of 7 feet, had built up until its crest stood about 30 feet above low water. At the proposed site of Dike No. 2 a scour had taken place, which would require the piles to be at least double the length of those originally proposed and extensive bracing not provided for in the plans. Soundings at that site, two days apart, showed a difference in depth of 10 feet; and in the draw-span of the bridge, where it was proposed to throw the channel, instead of having a bar from 10 to 15 feet above low water, the flood current had scoured a depth of about 20 feet below low water, attaining, temporarily at least, the object for which the work was planned.

Under these conditions the contractors reported February 3, 1903, that they were unable to finish the work by February 15, and applied for an extension of time until the condition of the river would permit them to complete the contract. The district officer recommended waiving the time limit for a reasonable period, with remission of engineering expenses, which was approved by the Chief of Engineers February 11, 1903.

A second flood, in March, 1903, reaching a height of 33.1 feet on the Shreveport gauge, and followed by continued high stages, prevented a resurvey of the locality until May, 1903. This survey indicated that the conditions were practically the same as when work was suspended, with continual slight caving below mouth of Cross Bayou, and that if dike construction is found to be necessary to maintain the channel which has scoured through the draw span, modifications of plan probably will be required, which are not covered by the terms of the existing contract.

The improvement of Red River was carried on under the local supervision of Mr. John Ewens, assistant engineer, aided by Mr. L. L. Grif-

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fith, junior engineer. On account of protracted ill health, Mr. Ewens has been absent since March 1, 1903. Mr. Griffith's report is appended hereto, to which reference is invited for further details and information respecting the work.

With the available funds it is proposed to continue snagging operations, etc., for the general improvement of the river from head of the Atchafalaya, Louisiana, to mouth of the Kiamichi, Indian Territory. As soon as the snag boat *Wagner* can be spared from the improvement of Ouachita and Black rivers it will be transferred to Red River to aid the *Honwell* in this work, and during the period of low water it may be found advantageous to supplement operations of the snag boats with the work of shore parties equipped with tools and high explosives for destroying obstructions to navigation. A personal inspection of the work at Shreveport will be made and a special report thereon submitted as soon as practicable. Should necessities arise for additional work in accordance with the existing project supplementary plans and recommendations will be submitted.

The amounts expended during the year and the unexpended balances July 1, 1903, are as follows:

Allotments.	Expended during year.	Balance unexpended July 1, 1903.
General improvement .....	\$18,137.27	\$93,760.06
At Shreveport, La. ....	1,443.96	20,556.04
Above Fulton, Ark .....	5,669.59	5,653.00
Total.....	25,250.82	119,969.12

*Money statement.*

July 1, 1902, balance unexpended .....	\$145,219.94
June 30, 1903, amount expended during fiscal year .....	25,250.82
July 1, 1903, balance unexpended .....	119,969.12
July 1, 1903, outstanding liabilities.....	973.53
July 1, 1903, balance available .....	118,995.59
July 1, 1903, amount covered by uncompleted contracts.....	19,931.92
{ Amount that can be profitably expended in fiscal year ending June 30, 1905, for maintenance of improvement, in addition to the balance unexpended July 1, 1903.....	
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	
	<sup>a</sup> 75,000.00

The appropriations for the early work, from 1828 to 1852, were as follows:

May 23, 1828.....	\$25,000.00	March 3, 1841.....	\$75,000.00
March 2, 1831.....	187.50	March 2, 1847.....	7,150.00
July 3, 1832.....	22,628.00	August 30, 1852 .....	100,000.00
June 28, 1834 .....	50,000.00		
March 3, 1835.....	50,000.00	Total .....	535,765.50
July 2, 1836.....	40,800.00	Amount expended.....	532,219.90
Do .....	30,000.00		
March 3, 1837.....	65,000.00	Amount carried to surplus fund .....	3,545.60
April 20, 1838 .....	70,000.00		

<sup>a</sup> Biennial appropriation should be \$150,000.

The appropriations since 1872 have been as follows:

June 10, 1872 .....	\$20,000	July 5, 1884 .....	\$75,000
March 3, 1873 .....	150,000	August 5, 1886 .....	75,000
June 23, 1874 .....	80,000	August 11, 1888 .....	65,000
March 3, 1875 .....	50,000	September 19, 1890 .....	35,000
August 14, 1876 .....	20,000	July 13, 1892 .....	3,000
April 10, 1869 .....	35,000	August 18, 1894 .....	100,000
February 7, 1878 .....	4,500	June 3, 1896 .....	28,000
June 18, 1878 .....	6,000	March 3, 1899 .....	2,000
March 3, 1879 .....	24,000	June 13, 1902 .....	145,000
June 14, 1880 .....	25,000	Total .....	3,500
March 3, 1881 .....	15,000		150,000
August 2, 1882 .....	22,500		3,500
	10,000		100,000
	25,000		3,000
	60,000		150,000
	10,000		135,000
	10,000		
	75,000		

## COMMERCIAL STATISTICS.

Navigation of Red River above the Atchafalaya River, Louisiana, to Fulton, Ark., was not suspended during the year, except by the bar at Shreveport, La., but at the lowest stages it was difficult on account of numerous bars and shoal crossings.

*List of steamboats in the Red River trade during the fiscal year.*

Name.	Class.	Tonnage.	Length.	Breadth.	Depth.	Draft.		Between—	Round trips.	Passengers.
						Light.	Loaded.			
Electra .....	Stern wheel.	272	170	35	5.2	2.3	7.1	New Orleans and Shreveport, La.	24	
Alma .....	do.	98	115	32	4.0	2.0	6.0	do.	8	
W. T. Scovell .....	do.	154	160	31	3.7	1.5	4.0	do.	11	
Red River .....	do.	97	155	28	3.5	1.6	5.0	do.	13	
Gem .....	do.	97	135	28	3.6	2.0	5.1	Shreveport, La., and Garland, Ark.	1	658
Lillie M. Barlow a .....	do.	46	119	18.2	2.6	1.5	3.0	New Orleans and Shreveport, La.	2	
Susie W. .....	do.	51	106.5	20	2.9	1.4	2.5	Shreveport, La., and Garland, Ark.	1	
Anna Tardy .....	do.	71	81	18	4.0	2.0	3.0	Shreveport, La., and local points.	12	
Kingfisher .....	do.	27	74	16.1	2.5	1.7	2.1	Shreveport, La., and Garland, Ark.		
Geo. L. Bass .....	do.	53	91	21	3.3	1.8	3.0	Fulton, Ark., and points above.		
Emma .....	Side wheel.							Alexandria and Breazales, La.	9	
								Shreveport, La., and local points.		

<sup>a</sup> Sunk 6 miles above Shreveport, La., March, 1903.

*Summary of commerce reported.*

Articles.	1902-3.
Cotton .....	Tons.
Cotton seed .....	12,778
Live stock .....	16,226
Lumber .....	80
Saw logs .....	2,115
Staves .....	41,125
Brick .....	1,996
	1,404



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## Summary of commerce reported—Continued.

Articles.	1902-3.
	<i>Tons.</i>
Shingles.....	324
Railroad ties.....	2,500
Provisions.....	96
Grain.....	50
Miscellaneous.....	740
Total down freight.....	79,433
Return freight.....	16,787
Total.....	96,220
Estimated value.....	\$4,074,000

In addition to the above is the commerce of Ouachita and Black rivers, which passes up and down Lower Red River. During the fiscal year 1902-3 this aggregated 236,179 tons, valued at \$5,619,000, and the business of the past fourteen years ranges between 73,679 and 313,863 tons per annum, with values estimated at \$3,293,000 to \$10,234,250, the average of the fourteen years being 176,906 tons, valued at \$6,339,300.

## REPORT OF MR. L. L. GRIFFITH, JUNIOR ENGINEER.

UNITED STATES ENGINEER OFFICE,  
Vicksburg, Miss., June 30, 1903.

CAPTAIN: I have the honor to submit a report of operations on Red River, Louisiana, Arkansas, Texas, and Indian Territory during the fiscal year ending June 30, 1903.

## GENERAL IMPROVEMENT.

July 1, 1902, the U. S. snag boat *C. W. Howell*, Watkins Decker, master, was working upstream, 4 miles above Campti, La., and arrived at Shreveport, La., August 6, 1902, where the crew was reduced to a minimum and the boat laid up for repairs. September 22, 1902, the boat was ready for service and left Shreveport, La., working downstream, removing shore snags and leaning trees when the stages were too high for advantageous work in the channel. Work was carried as far down as Montgomery, La., 158 miles below Shreveport. December 4, 1902, the *Howell* was sent above Shreveport for temporary relief work in the overflowed districts, after which it continued upstream, removing dangerous snags on the way, to within 15 miles of the mouth of the Kiamichi River, Indian Territory. On account of low stages, the boat worked back to Shaw Ferry, above Fulton, Ark., and proceeded upstream on the next rise, working as far as the mouth of the Kiamichi River. It then continued up to Arthur City, Tex., to obtain information respecting that portion of the river. The boat left Arthur City March 13, and arrived at Shreveport April 8, 1903. After a few necessary repairs the boat left Shreveport May 5, working downstream in temporary charge of James H. Britton, Watkins Decker having been granted leave of absence on account of sickness until June 1, 1903, when he resumed command and continued the work downstream to St. Maurice, La., 328.8 miles below Fulton, Ark.

The work done previous to the high water was very effective and was generally commended by the steamboat men. Since the floods of December, 1902, and March, 1903, however, the amount of work has been so great that one boat could not handle it, and some portions of the river are suffering the worst condition they have been in for years, chiefly on account of the seven cut-offs which occurred during the two high stages at the following places:

Place.	Miles below Fulton, Ark.	Place.	Miles below Fulton, Ark.
Pandora.....	175.3	Home Place.....	254.7
Hogskin Point.....	214.6	Ashland.....	256.5
Magnolia.....	221.6	Stallings.....	258.8
Lovely Point.....	225.6		

Estimated total shortening of the river, 21½ miles.

As a result of these cut-offs, the caving not only increases the number of snags and destroys the regimen of the river but levees have been destroyed that will put the already heavily-taxed people to their last extremity to repair, hindering the progress of any new work. A report of Mr. Frank M. Kerr, assistant State engineer, on the subject is submitted herewith.

Until this year the river undoubtedly has been improving gradually in depth and width, as shown by the continued navigation at lower stages than in former years. During the past year navigation was not suspended from Fulton to the mouth. The maximum draft that can be carried at mean low water is 3 feet to Montgomery, La., 162.5 miles above the Atchafalaya; 2½ feet to Shreveport, La., 320.5 miles; and 2 feet to Fulton, Ark., 508.6 miles.

The following is a summary of the work performed by the *Howell*:

Snags pulled .....	1, 032
Stumps destroyed .....	94
Shore snags cut .....	477
Side jams removed .....	24
Jams removed .....	2
Logs removed from channel .....	33
Leaning trees felled .....	3, 054
Trees girdled .....	284
Square yards of willows and brush cut .....	160

The range between high and low water at the several stations on Red River is as follows:

Gauge station.	Low water.		High water.		Range.
	Date.	Reading.	Date.	Reading.	
		<i>Feet.</i>		<i>Feet.</i>	<i>Feet.</i>
Arthur City, Tex .....	Jan. 15-16, 1872 .....	1. 50	Not given .....	37. 00	35. 50
Fulton, Ark .....	Sept. 19-25 and Oct. 20-22, 1896.	. 10	July 17, 1876 .....	35. 75	35. 65
Garland, Ark <sup>a</sup> .....	Sept. 22-25, 1896 .....	— . 20	Mar. 24, 1894 .....	28. 50	28. 70
Shreveport, La .....	Dec. 2-4, 1894 .....	— 5. 50	May 28, 1892 .....	35. 70	41. 20
Alexandria, La .....	Sept. 29, 1881 .....	— 8. 70	June 12-13, 1882 .....	38. 25	41. 95
Red River Landing, La. ...	Nov. 14, 1896 .....	— . 60	May 14-15, 1897 .....	50. 20	50. 80

<sup>a</sup> Gauge discontinued December 31, 1899.

The head of navigation is the mouth of the Kiamichi River, Indian Territory.

#### CHANNEL AT SHREVEPORT, LA.

By river and harbor act of June 13, 1902, \$15,000 could, in the discretion of the Secretary of War, be spent for the improvement of the channel at Shreveport, La. A complete survey of the locality was made in July and August, 1902, and plans for the improvement were prepared, which contemplated the construction of four silt-forming and deflecting dikes, to restore the channel to its former location under the draw of the Vicksburg, Shreveport and Pacific Railway bridge. The plans were approved and contract was let to Messrs. Hunter & Frey, of Memphis, Tenn., who began work in January, 1903, immediately after the highest water (34.1 feet) in Red River in nine years. They drove 1,536 linear feet of piles in Dike No. 1, about one-third the quantity required to build the dike. Soundings taken January 7 showed such changes in the channel since the high water as would require longer piles and a change of plan, and as all the bars in the vicinity had filled about 15 feet, the few available willows were buried in the sand. A good channel had formed under the draw of the bridge and an abnormal scour had taken place just below the mouth of Cross Bayou, increasing the depth on the site of Dike No. 2, 20 feet. Permission was granted the contractors to suspend work until the season of low water, when it was thought the river would have again assumed its normal condition and they would be better prepared to prosecute the work. Another high stage followed in March, reaching 33.1 feet on the gauge at Shreveport, which resulted in a continuation of the effects of the preceding flood of December. A resurvey was made in May, 1903, to determine whether any further work would be necessary to maintain the present channel. A review of the reports for 20 years back shows that the channel has changed from time to time from one side to the other, according to the amount of flow from Cross Bayou. In July, 1897, a wing dam, built in previous years, and located at about the proposed site of Dike No. 4, was repaired and immediately gave

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an increased depth of 3 feet under the draw. Since that time the dam gradually has deteriorated and the long period of seven years without any very high stage has allowed the channel to work back under the fixed spans. The two high waters of December, 1902, and March, 1903, by overflow around the end of the levee system, and by a break in the levee at Thompson's, 50 miles above Shreveport, caused such an outflow from Cross Bayou as to turn the current of Red River to the east side and under the draw, resulting in the conditions desired. The channel on the Shreveport side, however, remains practically the same, and with the low-water season, and the closing of the Thompson crevasse now in progress, the left side probably will fill again and the channel return to the right bank.

Very respectfully, your obedient servant,

L. L. GRIFFITH, *Junior Engineer.*

Capt. CHAS. S. BROMWELL,  
*Corps of Engineers.*

LETTER OF MR. FRANK M. KERR, ASSISTANT STATE ENGINEER OF LOUISIANA.

STATE OF LOUISIANA,  
OFFICE BOARD OF STATE ENGINEERS,  
*New Orleans, La., June 16, 1903.*

DEAR SIR: In compliance with your request of May 8, 1903, I take pleasure in furnishing you herewith a tabulated statement showing the levee work on Red River undertaken by the local levee districts and the State of Louisiana under contracts entered into during the fiscal year ending June 30, 1903.

## CADDO LEVEE DISTRICT.

	Amount.	Value.
	<i>Cu. yds.</i>	
By the district.....	878, 778	\$135, 269. 67
By the State.....	203, 865	39, 249. 80
Total.....	1, 082, 643	174, 519. 67

## BOSSIER LEVEE DISTRICT.

By the district.....	385, 959	\$65, 536. 25
By the State.....	260, 000	40, 170. 00
Total.....	645, 959	105, 706. 25

Or an aggregate in the two districts undertaken by the districts and the State of 1,728,602 cubic yards, costing \$280,225.92.

The Red River, Atchafalaya, and Bayou Boeuf levee district was not called upon during this period to undertake any levee work on Red River, but on other streams in the district as much as 290,000 cubic yards of earthwork in levees, costing about \$60,000, and of work for improving drainage, amounting to about 1,300,000 cubic yards, costing about \$175,000, is under way.

The Bossier levee district, in addition to the levee work shown in the statement furnished as having been placed under contract during this period, is, at this time, advertising for proposals to build new levees at Rough and Ready, 166.5 miles below Fulton, and at Scopini, 207.5 miles below Fulton, amounting to about 205,000 cubic yards.

As you already know, Red River was visited, at a short interval within the past season, by two high waters of considerable proportions, the first, culminating at Shreveport December 16, 1902, reading 34.1 feet on the gauge, reached stages along many stretches of its length in the Caddo and Bossier levee districts, from 1 foot to 2½ feet above any waters of previous record.

The second flood, culminating at Shreveport March 23, 1903, at a stage there but 1 foot lower than the first, failed to develop stages at other points as high comparatively as those developed on the first flood.

Notwithstanding these high stages of water in Red River, its levee lines proved

equal to the task devolving upon them, except at Thompson's, 130 miles below Fulton. Here a breach in the line occurred and remained open during both floods.

The closure of this breach, as shown by the tabulated statement, has been undertaken by the State, and the new levee there is approaching completion.

The grade of the levees on Red River was found deficient at but two places in Caddo—at the head of Simpsons Lake, United States levee, due to excessive settlement, and at Hurricane Bluff, built by riparian owners; and in Bossier at Dortch's and Mercer's, built by district.

Except for caving banks, both floods would have been carried down Red River without serious cause for apprehension to anyone concerned.

Owing, however, to the rapid enlargement of the section of Red River along the Caddo and Bossier levee district fronts, resulting from the more successful confinement of its flood waters to the main stream by means of levees than in its past history, the natural tortuousness of the stream, opposing numerous concave bends to the energy of the current, and the serious disturbance of its regimen by the number of cut-offs which occurred during high water, caving banks are more general and serious in these districts than will be readily understood without an intimate acquaintance with the facts.

Hence it follows that 95 per cent of the work undertaken on Red River during this fiscal year has been placed in new lines of levees rendered necessary by caving banks, and, in addition to this, it appears evident that levee work at the following-named points will, in the near future, from the same cause, be required.

## CADDO LEVEE DISTRICT.

Name of levee.	Miles below Fulton.	Cubic yards.
Elmer Slough to Conshatta Place .....	140.5-141.5	125,000
Cedar Bluff .....	150.75	55,000
Sterling Bayou .....	156.75	25,000
Dixie .....	195.5-196.0	135,000
Riverdale .....	201.5-202.0	85,000
Long Point .....	210.0-210.5	50,000
Musser's .....	212.25	15,000
Magnolia .....	222.5-223.0	60,000
Lower Cross Keys .....	237.5-238.0	25,000
Total .....		575,000

## BOSSIER LEVEE DISTRICT.

Rough and Ready .....	166.25-166.75	100,000
Benoits Bayou .....	176.75	115,000
Pat Cash's .....	184.00	65,000
Fruitt's .....	200.25	50,000
Scopini .....	207.75	105,000
Mercer's .....	211.5-212.5	95,000
Magenta .....	214.25-214.75	50,000
Total .....		580,000

It is also apparent that, as a greater safeguard against future high waters in Red River, the following enlargement should be undertaken in the Caddo levee district, viz:

Name of levee.	Miles below Fulton.	Cubic yards.
Blanton Bluff to Scott Slough .....	117.5-129.5	150,000
Rush Bayou (on Old River) .....	212.5-213.0	25,000
Pascagoula (on Old River) .....	215.5-216.5	25,000
Total .....		200,000

In the Caddo levee district, that part of the system above Shreveport terminates, at this time, at Buckhall Plantation. This should be extended as far down, at least, as Cuba Place, and will require some 600,000 cubic yards of earthwork.

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In the Bossier levee district the line of public levee terminates, at this time, at Bear Point, but should, as soon as the means become available, be extended to the lower boundary of the district at Swift Chute Bayou. This will require provision for about 150,000 cubic yards of earthwork.

To undertake the work of this fiscal year, both the Caddo and the Bossier levee districts have exhausted all their immediate resources and contracted against the revenues of the districts collectible on the tax rolls of future years, up to and including the year 1905. It is, therefore, evident that any assistance the General Government can possibly accord the districts on Red River in their struggle for protection against overflow is greatly needed.

At times between 1892 and 1900 the General Government, fortunately, came to the assistance of the levee districts on Red River to some extent, and levees aggregating about 960,000 cubic yards, costing about \$143,000, were constructed at certain points in these districts. Beyond this no levee work has been done by the Government on Red River. On the other hand, from 1892 to date the levee work on Red River undertaken by the local levee districts and State has amounted to nearly 8,500,000 cubic yards, costing about \$1,355,000, not including discount, interest, or other incidental expenses of administration.

The particular levees in regard to which I spoke to you some time ago in Shreveport were the Cavitt Levee, part of the Red Bayou Levee built in 1895-96 by the General Government, the Dortch Levee, and a part of the Scopini Levee built by the General Government in 1894-5. Later, conditions became so grave at both of these places that the districts could no longer defer action in regard to them, and new levees are already under construction at both, payable from funds collectible on future years. If, in lieu of these two levees, covering breaches in levees built by the General Government, amounting in the aggregate to 385,000 cubic yards, the latter could possibly undertake some of the other work required in the near future in the districts, it would be greatly appreciated by the levee districts, and give them renewed courage in their efforts to maintain their lines of defense against the high waters of Red River.

Respectfully,

FRANK M. KERR, *Assistant State Engineer.*

MR. L. L. GRIFFITH,  
*U. S. Junior Engineer, Vicksburg, Miss.*

### X 2.

#### IMPROVEMENT OF CYPRESS BAYOU, TEXAS AND LOUISIANA.

No work was done during the year beyond that required for care of the United States dredge at Shreveport, La.

Under present conditions it is impracticable to place this dredge in Cypress Bayou and to return it to Red River after expending the available funds. In six years there has been but one period, of short duration, during which there was a stage high enough to permit of towing the boat above Albany flats.

The expenditure of the available funds for dredging, or for the removal of stumps, etc., will afford no improvement of navigation between Shreveport and Jefferson, and it is recommended that the project be repealed and that the funds be paid into the Treasury. The work is considered unworthy of further improvement.

#### *Money statement.*

July 1, 1902, balance unexpended .....	\$4, 802. 26
June 30, 1903, amount expended during fiscal year .....	1, 236. 10
July 1, 1903, balance unexpended .....	3, 566. 16

The appropriations for Cypress Bayou and the lakes have been as follows:

By act of—	
June 10, 1872 .....	\$10,000.00
March 3, 1873 .....	50,000.00
August 14, 1876 .....	13,000.00
June 18, 1878 .....	15,000.00
March 3, 1879 .....	6,000.00
August 5, 1886 .....	18,000.00
August 11, 1888 (allotted from appropriation for Red River) .....	5,000.00
September 19, 1890 (for survey) .....	10,000.00
July 13, 1892 (for survey) .....	2,000.00
July 13, 1892 (allotted from appropriation for Red River) .....	1,701.33
August 18, 1894 .....	10,000.00
June 3, 1896 .....	5,000.00
Total .....	145,701.33

#### COMMERCIAL STATISTICS.

There was no navigation between Shreveport and Jefferson during the year, and there has been no navigation or commerce since 1897. (See Report Chief of Engineers, 1897, p. 1898.)

A small gasoline boat of 12 tons, drawing 16 inches light and 18 inches loaded, reported 52 trips between Jefferson and Shanghai, 11 miles below; 100 trips between Shanghai and Benton, 13 miles below Jefferson, and 15 trips between Jefferson and Caddo Lake, 25 miles below.

#### Summary of commerce reported.

Articles.	Tons.	Articles.	Tons.
Cypress logs .....	20	Cord wood .....	2,000
Lumber .....	1,200	Total .....	4,550
Provisions .....	10	Estimated value .....	\$27,150
Grain .....	10		
Telephone poles .....	1,310		

### X 3.

#### IMPROVEMENT OF OUACHITA AND BLACK RIVERS, ARKANSAS AND LOUISIANA.

The U. S. snag boat *O. G. Wagner*, Robert Elflein, master, was repaired at Jonesville, La., in July and August, and was employed from August 18 to December 17, 1902. Operations extended from Beard Landing, Louisiana, 25.6 miles above the mouth of Black River, to Camden, Ark., a distance of 325 miles.

June 17, 1903, the *Wagner* left Monroe, La., to make a patrol and remove obstructions to navigation of the upper river. Operations were carried upstream 95 miles to within 1 mile of Caney Marie, Arkansas, where the water became too shoal for the boat to proceed farther, and June 23 to 30 the boat worked back to Monroe.

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The following obstructions to navigation were removed by the *Wagner* during the year, viz:

Snags pulled and destroyed .....	1, 086
Stumps pulled, cut, and destroyed .....	1, 163
Shore snags cut .....	1, 009
Side jams broken up and destroyed .....	2
Leaning trees felled .....	388
Logs cut up .....	673
Wreck removed (boilers of steamer <i>Sterling White</i> , sunk 1899, at Trenton, La.) ..	1

A party under Overseer J. R. Vaughan, equipped with tools, tackle, explosives, etc., was organized at Monroe, La., July 1, 1902, for work during the period of low water in Ouachita River between Monroe, La., and Camden, Ark., and in the various tributaries. There was a temporary rise of upper Ouachita River at this time, and July 3 to 6 the quarter boat, with party aboard, was towed from Monroe to Camden, where active operations commenced. From July 8 to September 24, 1902, the party worked downstream 140.5 miles to the mouth of Bayou Bartholomew, and was then transferred to that stream. The following is a list of the obstructions to navigation destroyed during this period:

Channel snags cut and destroyed .....	1, 297
Stumps cut and destroyed .....	572
Stumps removed from channel .....	34
Shore snags cut and destroyed .....	344
Logs cut and destroyed .....	894
Logs removed from channel .....	203
Leaning trees felled and destroyed .....	1, 403
Trees removed from channel .....	62
Square yards of willows and brush cut .....	1, 135
Cubic yards of earth removed from channel .....	11

After suspension of work the plant was laid up at Monroe, La., where repairs were made. As soon as there is a reasonable probability of continued low stages, snagging operations, etc., will be resumed.

## COMPLETION OF SURVEY FOR LOCKS AND DAMS.

Survey work in the field consisted of borings at the sites of Locks and Dams Nos. 4 and 6. Office work upon the maps and notes was continued during the year.

### LOCKS AND DAMS NOS. 4 AND 6.

The sites of the two locks and dams were acquired, partly by purchase and partly by donation, and jurisdiction over the same has been ceded to the United States under the laws of the States of Louisiana and Arkansas.

Plans and specifications for the construction of the two locks and dams have been prepared, and it is expected that the work will be let by contract in the near future.

A light-draft, steel hull, steam launch was purchased in February, 1903, at a cost of \$5,490, for use in connection with the construction of locks and dams, there being long stretches of this river where it was impracticable to make inspections or to transport instruments, supplies, etc., at low stages, before this boat was obtained.

For further details respecting the year's work, reference is invited to the report of Mr. H. M. Marshall, assistant engineer, appended hereto.

## ESTIMATES.

The unexpended balances June 30, 1903, were as follows:

For maintenance of improvement .....	\$12, 109. 36
For completion of survey .....	5, 022. 98
For Locks and Dams Nos. 4 and 6 .....	319, 629. 66
Total .....	336, 762. 00

These balances will be applied to the purposes stated.

The additional appropriation recommended is for the following work:

Completing Locks and Dams Nos. 4 and 6, being balance of amount pledged by river and harbor act approved June 13, 1902 .....	\$103, 954
Building Locks and Dams Nos. 3 and 8, in accordance with estimates contained in approved project .....	456, 842
Rebuilding snag boat <i>O. G. Wagner</i> .....	35, 000
Maintenance of improvement for one year by snagging work .....	20, 000
Maintenance of improvement at Catahoula Shoals by dredging .....	10, 000
Total .....	625, 796

If snagging operations for maintenance are continued under a biennial appropriation the amount should be increased to \$40,000.

*Money statement.*

July 1, 1902, balance unexpended .....	\$118, 197. 81
Amount appropriated by sundry civil act approved March 3, 1903 .....	250, 000. 00
Amount received from sales of property .....	568. 71
	368, 766. 52
June 30, 1903, amount expended during fiscal year .....	32, 004. 52
	336, 762. 00
July 1, 1903, balance unexpended .....	
July 1, 1903, outstanding liabilities .....	72. 67
	336, 689. 33
{ Amount (estimated) required for completion of existing project .....	1, 668, 576. 00
{ Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903:	
For works of improvement .....	\$560, 796. 00
For rebuilding snag boat <i>Wagner</i> .....	35, 000. 00
For maintenance of improvement .....	a 30, 000. 00
	625, 796. 00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

The appropriations have been as follows:

By act of—		By act of—	
March 3, 1871 .....	\$25, 000	August 5, 1886 .....	\$17, 500
March 3, 1871 .....	26, 000	August 11, 1888 .....	20, 000
June 10, 1872 .....	60, 000	September 19, 1890 .....	15, 000
June 10, 1872 .....	40, 000	July 13, 1892 .....	40, 000
March 3, 1873 .....	60, 000	August 18, 1894 .....	50, 000
August 14, 1876 .....	12, 000	June 3, 1896 .....	70, 000
June 18, 1878 .....	10, 000	March 3, 1899 .....	110, 000
March 3, 1879 .....	10, 000	June 13, 1902 .....	31, 500
June 14, 1880 .....	8, 000	June 13, 1902 .....	80, 000
March 3, 1881 .....	12, 000	March 3, 1903 .....	250, 000
August 2, 1882 .....	12, 000		
July 5, 1884 .....	15, 000	Total .....	974, 000

a Biennial appropriation should be \$50,000.



# 1376 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

## COMMERCIAL STATISTICS.

During the fiscal year 1903 Ouachita and Black rivers were reported navigable for New Orleans packets to Camden, Ark., from November 20 to June 15. At lowest stages the New Orleans boats could not ascend above Harrisonburg, La. Small light-draft boats that ply in the tributaries could run the main river nearly the entire year.

*List of steamboats engaged in the trade during the fiscal year.*

Name.	Class.	Tonnage.	Length.	Breadth.	Depth.	Draft.		Between—	Round trips.	Passengers.
						Light.	Loaded.			
America.....	Stern-wheel.	427	200	38	6.5	4	11.3	New Orleans and as far up as water permitted.	52	3,452
Ouachita.....	do.	98	140	32	4	2	6.1	New Orleans and Camden.	9	320
City of Camden..	do.	299	175	35	5	2.5	5.5	do.	1	10
								New Orleans and Champagne.	1	7
Parlor City.....	do.	136	125	26	3.7	2	5	Monroe and Camden.	1	11
								Monroe and Champagne.	5	29
								Monroe and Wilmington.	20	161
H. M. Carter.....	do.	97	156	28	6	1.6	5	Not reported	.....	.....
Lillie <sup>a</sup> b.....	do.	61	120	26	3.5	2	4	New Orleans and Monroe.	1	.....
John B. Robinson	do.	47	90	18	3.5	1.3	3	Monroe to up points.	24	.....
Sam Atlee <sup>a</sup> b.....	do.	234	133.3	26.3	4	.....	.....	Baton Rouge and Ouachita River.	.....	.....
Alarm <sup>a</sup> b.....	do.	189	142	26	4.3	3.4	4.4	Towing rafts to Monroe.	.....	.....
Pearlie Davis <sup>a</sup> b.....	do.	140	127	26	4	.....	.....	do.	.....	.....
May Fisher <sup>a</sup> b.....	do.	52	92	18.8	4	2	2	Baton Rouge and Ouachita River.	.....	.....
Dixie <sup>a</sup> b.....	do.	71	119.1	20.6	3.8	1.2	7.5	Camden to New Orleans.	1	.....
J. W. Swayze.....	do.	86	110	21	3.7	1.5	3	Jonesville and Tensas River.	.....	.....
T. K. Greene.....	do.	32	81.8	17.3	3.1	1.6	3.5	Not reported	.....	.....
Union <sup>b</sup> .....	Gasoline.	14	.....	.....	.....	1.3	2.5	Monroe and lake landing.	17	50
Skipper.....	Tug	3	.....	.....	.....	2.5	3.5	Monroe and Roland raft.	50	.....

<sup>a</sup> Towboat.

<sup>b</sup> With one or more barges.

## Summary of commerce reported.

Articles.	1902-3.	Articles.	1902-3.
	Tons.		Tons.
Cotton .....	21,918	Staves .....	37,096
Cotton seed .....	15,596	Miscellaneous .....	19,436
Hides and skins .....	3		
Live stock .....	335	Total .....	236,179
Lumber .....	1,442		
Saw logs .....	140,353	Estimated value.....	\$5,619,000

The above statistics are incomplete. The steamer *H. M. Carter*, said to have been one of the largest carriers, and one or more small boats paid no attention to requests for information.

June 16, 1903, the Monroe Railway and Navigation Company was chartered, having for its chief object the operation of a line of steamboats between Jonesville, La., and Camden, Ark. The company states that it is intended to operate three steamboats having a combined tonnage of 550 tons, so as to afford at least a weekly service in the main river and its tributaries. The formation of this company is due to the adoption of the project for locks and dams.

# APPENDIX X—REPORT OF CAPTAIN BROMWELL. 1377

## Receipts and shipments of bales of cotton at Camden, Ark.

Route.	1902-3.	
	Received.	Shipped.
Missouri Pacific Railway .....	3,476	3,754
St. Louis Southwestern Railway .....	4,313	7,336
River .....	1,287	19,768
Wagon .....	22,713	.....
Total .....	31,789	30,858

## REPORT OF MR. H. M. MARSHALL, ASSISTANT ENGINEER.

UNITED STATES ENGINEER OFFICE,  
Vicksburg, Miss., June 30, 1903.

CAPTAIN: I have the honor to submit the following report on improvement of Ouachita and Black rivers, Arkansas and Louisiana, for the fiscal year ending June 30, 1903:

### MAINTENANCE.

The U. S. snag boat *O. G. Wagner* was undergoing repairs at Jonesville, La., at the beginning of the year. Her machinery was overhauled and she was put in as good condition generally as her age and infirmities would permit. The boat was built in 1875 and had a new steel sheathing put on her bottom in 1886. Since then she has never been docked. Her condition was described in the Annual Report of the Chief of Engineers for 1901 at page 2035, and it was recommended that a new hull should be built, estimated to cost \$25,000. Two years' use, with only minor repairs, has brought her to the edge of the scrap pile, and one more season's work will render her worthless for snagging. By putting it off the cost of rebuilding has now run up to \$30,000 or \$35,000, and it is urgently recommended that provision be made before the river shall be left without a snag boat.

The *Wagner* resumed work August 18, 1902, with Robert Elflein master, and continued till December 13, 1902, when the river became too high to accomplish anything. Work was carried over the stretches of the river as the stages proved most advantageous, practically the whole river having been worked over three times.

June 17 to 30, 1903, the *Wagner* made a patrol over the river above Monroe, La., to remove obstructions to navigation, but was compelled to turn back at a point 95 miles above Monroe and about 1 mile below Caney Marie on account of shoal water.

The following obstructions to navigation were removed by the *Wagner* during the working season of 1902-3, viz:

Snags pulled and destroyed .....	1,086
Stumps pulled, cut, and destroyed .....	1,163
Shore snags cut .....	1,009
Side jams broken up and destroyed .....	2
Leaning trees felled .....	388
Logs cut up .....	673
Wreck removed (boilers of steamer <i>Sterling White</i> , sunk 1899, at Trenton, La.) ..	1

Besides the work of the snag boat, a chopping party under Overseer J. R. Vaughan cleared obstructions from the channel between Camden, Ark., where work commenced July 8, 1902, and the mouth of Bayou Bartholomew, where work ended September 24. The following obstructions were removed by the use of dynamite, axes, etc., viz:

Channel snags cut and destroyed .....	1,297
Stumps cut and destroyed .....	572
Stumps removed from the channel .....	34
Shore snags cut and destroyed .....	344
Logs cut and destroyed .....	894
Logs removed from channel .....	203
Leaning trees felled and destroyed .....	1,403
Trees removed from channel .....	62
Square yards of willows and undergrowth cleared .....	1,135
Cubic yards of earth removed from channel .....	11

# 1378 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

The figures representing the work done by the snag boat and the chopping party should not be confounded, for the obstructions taken out by each usually differ altogether in size, the chopping party passing by snags, etc., which must be removed by the machinery of the boat.

Snag work is not done with the expectation of deepening the river, but to render it safer for boats while running. Neither is it a work which can be completed, for the banks cave, or snags are moved by the current into the line of travel at each high water. The only work heretofore done by the United States to deepen the navigation was at Catahoula shoals. Dredging and wing dams there increased the depth to 40 inches where it had been 15 inches. The work, however, has transferred the shoal part above and part below its former location. In the report of the engineer officer for 1895 (Report of Chief of Engineers, 1895, p. 1891) it was forecasted that the dredging would need to be continued below through Bayou Louis bar. Inasmuch as that work could be done in one year, and would permit light-draft boats to reach Columbia all the year, it would be well worth the expenditure of, say, \$10,000. It would benefit navigation where locks and dams under the approved project will be last built, and would give earlier access to those first built.

Gauges were read at Camden, Ark., Riverton and Black River Station, La., during the year. The highest and lowest stages reached were as follows:

Station.	Highest reading.		Lowest reading.	
	Date.	Feet.	Date.	Feet.
	1903.		1902.	
Camden, Ark.....	Feb. 20.....	39.6	July 23-26.....	3.96
	Mar. 14.....			
Riverton, La.....	Apr. 28-31.....	50.1	Sept. 27.....	4.25
Black River Station, La.....	Apr. 20, 21.....	52.25	Sept. 28.....	9.94

Gauge zero above Gulf level: Camden, 71.17 feet; Riverton, 15 feet; Black River Station, 4.57 feet.

## SURVEY.

Survey work in the field consisted of borings at Lock sites Nos. 4 and 6, but subsequent shifting of the location will render other borings necessary. These will be made as soon as the condition of the river will permit. The river has been unusually full the last year, boats plying to Monroe practically all the time and to Camden about ten months.

Work in the office has consisted of replotting the survey on heavy drawing paper to take the place of the original maps, which were on tracing cloth, and became distorted so as to be virtually useless to print from, and reindexing the field notes. The main lines of survey were plotted in pencil on all the sheets, 48 in number, and the details on 23 sheets, 16 of which have been finished in ink, except the scales and titles. The tracings of 3 map sheets of Bayou Bartholomew were finished, which completed the survey of that stream. Hypsometry and hydrography notes have been indexed for final record complete, and topography notes partly finished.

## LOCKS AND DAMS.

Title papers for the land at lock sites were prepared, and after being approved by the Attorney-General the land was purchased. At Lock No. 4, near Monroe, La., about 8 acres were acquired at a cost of \$1,000, and about 1 acre on the west bank was donated by Mr. H. La Baum. At Lock No. 6, near Roland Raft, Ark., 44.18 acres were acquired at a cost of \$441.80. Jurisdiction over the land is given the United States in the State of Louisiana by general act heretofore passed by the legislature. The legislature of Arkansas at its recent session ceded jurisdiction by special act No. 75, and later passed a general act, No. 180, which applies to all lands purchased by the United States.

Plans and specifications have been made for both locks and dams, except some of the drawings for Lock 6, which differ from those at Lock 4 simply in dimensions and the details of minor parts of the valves, etc.

A launch 65½ feet long, 10½ feet wide, with draft of 22 inches, was purchased for inspection and dispatch between locks. The boat has a steel hull, divided into five water-tight compartments, and the cabins afford convenient quarters for eight persons. The machinery is quadruple expansion, condensing type, with a Ward marine tubu-

lar boiler. With a fuel consumption of 225 pounds of coal she will run about 10 to 12 miles an hour in still water. The boat was built in 1897, and the purchase price was \$5,490. The boat supplies a long-felt want in towing quarter boats, and will render it practicable to get over the river at almost the lowest stages. The last inspection by the district engineer officer was made last November from Camden to Lake Landing, in a small gasoline boat which was entirely without accommodations, making it necessary to camp out, and as the boat scarcely ran 5 miles an hour downstream the progress was slow and painful.

Through the courtesy of Maj. E. H. Ruffner and Capt. H. M. Chittenden enough of the metal frames used on the Big Sandy and Osage River dams were obtained to build models of the weir and drift pass at Lock and Dam site No. 4. It is expected that a contract soon will be let for construction of both locks and dams, and that the work will begin this low water, the lock and part of each dam to be completed during this low-water season and the remainder next season.

Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903:

Completing Locks 4 and 6 .....	\$103,954
Locks 3 and 8 .....	456,842
Rebuilding snag boat <i>Wagner</i> .....	35,000
Maintenance of improvement .....	40,000
Dredging at Catahoula shoals .....	10,000
Total .....	645,796

Very respectfully, your obedient servant,

H. M. MARSHALL,  
*Assistant Engineer.*

Capt. CHAS. S. BROMWELL,  
*Corps of Engineers.*

#### X 4.

#### IMPROVEMENT OF BAYOU BARTHOLOMEW, BOEUF RIVER, TENSAS RIVER AND BAYOU MAÇON, AND BAYOUS D'ARBONNE AND CORNEY, LOUISIANA.

These tributaries of Ouachita River are not navigable at low water. The plan in process of execution is for maintenance of their improvement by removing snags, logs, wrecks, leaning timber, etc., to afford reasonably safe navigation at medium and high stages. Drift, caving and sliding banks, and the rapid growth of vegetation constantly add obstructions, which accumulate rapidly and become more difficult to remove each year they are permitted to remain.

The localities for which estimates have been made are as follows:

(a) Bayou Bartholomew from mouth to McComb Landing, Ark., 141 miles; estimated annual cost of maintenance, \$2,500.

(b) Boeuf River from mouth to Wallace Landing, La., about 170 miles; estimated annual cost of maintenance, \$2,500.

(c) Tensas River from mouth to Westwood Place, La., 81 miles, and Bayou Maçon, a tributary of Tensas River, from its mouth to Floyd, La., 112 miles; estimated annual cost of maintenance, \$2,500.

(d) Bayou D'Arbonne from mouth to Bayou Corney and up that stream to Cobb Landing, La., 57 miles. About \$1,000 per annum will be required for maintenance, but no estimate for the purpose has been previously submitted.

Operations during the fiscal year ending June 30, 1903, were as follows:

# 1380 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

## (a) BAYOU BARTHOLOMEW.

The party which had been employed in upper Ouachita River, under Overseer J. R. Vaughan, was transferred to Bayou Bartholomew September 25, and September 25 to December 12, 1902, operations were carried upstream to McComb Landing, Ark., and back to the mouth.

The following is a summary of the work performed:

Channel snags cut and destroyed .....	1, 751
Logs removed from channel .....	199
Trees removed from channel .....	45
Jams broken up and destroyed .....	3
Side jams broken up and destroyed .....	5
Shore snags cut and destroyed .....	366
Stumps cut and destroyed .....	440
Logs cut and destroyed .....	1, 405
Leaning trees felled and destroyed .....	829
Square yards of willows and brush cut .....	19, 480

## (b) BAYOUS D'ARBONNE AND CORNEY.

December 13 to 17 the quarter boat was towed up bayous D'Arbonne and Corney to Cobb Landing, La., where work for the removal of obstructions to navigation commenced. December 18, 1902, to February 14, 1903, operations were carried downstream to Ouachita River, and the following is a summary of the work performed:

Channel snags cut and destroyed .....	161
Logs removed from channel .....	471
Trees removed from channel .....	74
Jam broken up and destroyed .....	1
Side jams broken up and destroyed .....	6
Shore snags cut and destroyed .....	78
Stumps cut and destroyed .....	74
Logs cut and destroyed .....	958
Leaning trees felled and destroyed .....	451
Square yards of willows and brush cut .....	4, 889

To save the cost of building quarter boats and equipping separate organizations for each of the four works of maintenance, it was proposed to employ but one party, moving from one stream to another as work was completed, or as the stages of water or condition of funds might render necessary. This party was detained in upper Ouachita River longer than was anticipated, and, in consequence, no work could be done in Boeuf River and in Tensas River and Bayou Maçon before the protracted period of high water set in. During the high-water season the plant was laid up at Monroe, La., where the hull of the quarter boat was rebuilt and other repairs made, in readiness to begin work in Boeuf River as soon as the water recedes to a favorable stage.

The latter part of June, 1903, the boat was towed and cordelled from Monroe up Boeuf River to the Vicksburg, Shreveport and Pacific Railway Bridge near Girard, La., for the purpose of resuming work early in July. The following obstructions to navigation were removed on the way up the river, viz:

Logs removed from channel and destroyed .....	26
Stumps destroyed .....	10

Work was carried on under the local direction of Mr. H. M. Marshall, assistant engineer, whose report is appended hereto.

**APPENDIX X—REPORT OF CAPTAIN BROMWELL. 1381**

*Money statement.*

July 1, 1902, balance unexpended .....	\$22,741.06
June 30, 1903, amount expended during fiscal year .....	6,150.68
July 1, 1903, balance unexpended .....	16,590.38
July 1, 1903, outstanding liabilities .....	413.61
July 1, 1903, balance available .....	16,176.77

{ Amount that can be profitably expended in fiscal year ending June 30, 1905, for maintenance of improvement, in addition to the balance unexpended July 1, 1903..... <sup>a</sup>8,500.00  
 Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.

The appropriations for the improvement of these streams have been as follows:

By act of—	Bayou Bartholomew.	Boeuf River.	Tensas River and Bayou Maçon.	Bayous D'Arbonne and Corney.	Total
March 3, 1881 .....	\$8,000.00	\$5,000.00	\$3,000.00	.....	\$16,000.00
August 2, 1882 .....	5,000.00	5,000.00	.....	.....	10,000.00
July 5, 1884 .....	5,000.00	5,000.00	4,000.00	\$5,000.00	19,000.00
August 5, 1886 .....	5,000.00	5,000.00	4,000.00	2,000.00	16,000.00
August 11, 1888 .....	5,000.00	6,000.00	5,000.00	2,000.00	18,000.00
September 19, 1890 .....	5,000.00	5,000.00	5,000.00	2,000.00	17,000.00
July 13, 1892 .....	5,000.00	10,000.00	5,000.00	4,000.00	24,000.00
August 18, 1894 .....	5,000.00	8,000.00	5,000.00	2,000.00	20,000.00
June 3, 1896 .....	4,000.00	6,000.00	5,000.00	.....	15,000.00
March 3, 1899 .....	5,000.00	6,000.00	4,000.00	.....	15,000.00
June 13, 1902 (allotments) .....	5,000.00	5,000.00	2,500.00	2,500.00	15,000.00
Total amount appropriated .....	57,000.00	66,000.00	42,500.00	19,500.00	185,000.00
Total amount expended.....	54,679.35	54,992.52	39,801.33	18,936.42	168,409.62
Balance unexpended.....	2,320.65	11,007.48	2,698.67	563.58	16,590.38

**COMMERCIAL STATISTICS.**

During the fiscal year 1903 Bayou Bartholomew was reported navigable during September, 1902, and from December, 1902, to and including May 31, 1903.

*List of boats engaged in the trade during the fiscal year.*

Name.	Class.	Tonnage.	Length.	Breadth.	Depth.	Draft.		Between—	Round trips.	Passengers.
						Light.	Loaded.			
John B. Robinson .....	Stern-wheel.	47	Feet. 90	Feet. 18	Feet. 3.5	Feet. 1.3	Feet. 3	Monroe and Poplar Bluff .....	.....	.....
Parlor City .....	do ..	136	125	26	3.7	2	5	Monroe and State Line ...	2	3
Union c. ....	Gasoline.	14	.....	.....	.....	1.3	2.5	Monroe and Visterland ...	1	2
								Monroe and Pt. Pleasant..	3	17
								Monroe to State Line .....	10	15

<sup>a</sup> Biennial appropriation should be \$17,000.

<sup>b</sup> Act of August 18, 1894, also appropriated \$1,000 for Little D'Arbonne.

<sup>c</sup> With barge.

# 1382 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

## Summary of commerce reported for Bayou Bartholomew.

Articles.							1902-3.
							<i>Tons.</i>
Cotton .....							610
Cotton seed .....							780
Lumber .....							50
Miscellaneous .....							640
Total .....							2,080
Estimated value .....							\$171,000

During the fiscal year 1903, Boeuf River was reported navigable from December 1 to May 30.

## List of boats engaged in the trade during the fiscal year.

Name.	Class.	Tonnage.	Length.	Breadth.	Depth.	Draft.		Between—	Round trips.	Passengers.
						Light.	Loaded.			
Parlor City .....	Stern-wheel.	136	<i>Feet.</i> 125	<i>Feet.</i> 26	<i>Feet.</i> 3.7	<i>Feet.</i> 2	<i>Feet.</i> 5	Monroe and Mhoon Landing.	.....	.....

## Summary of commerce reported for Boeuf River.

Articles.							1902-3.
							<i>Tons.</i>
Cotton .....							75
Cotton seed .....							320
Miscellaneous .....							150
Total .....							545
Estimated value .....							\$30,000

During the fiscal year 1903 Tensas River was reported navigable to Jordan Point from October to June, and Bayou Maçon was navigable to Warsaw from December to June. Boats could navigate Lower Tensas River to Kirk Ferry all the year.

## List of boats in the trade during the fiscal year.

Name.	Class.	Tonnage.	Length.	Breadth.	Depth.	Draft.		Between—	Round trips.	Passengers.
						Light.	Loaded.			
J. W. Swayze .....	{Stern-wheel.	86	<i>Feet.</i> 110	<i>Feet.</i> 21	<i>Feet.</i> 3.7	<i>Feet.</i> 1.5	<i>Feet.</i> 3	Jonesville and Jordan Point.	.....	.....
Lillie a .....		61	<i>Feet.</i> 120	<i>Feet.</i> 26	<i>Feet.</i> 3.5	<i>Feet.</i> 2	<i>Feet.</i> 4	Jonesville and Warsaw.	.....	20
T. K. Greene .....	do ..	32	<i>Feet.</i> 81.8	<i>Feet.</i> 17.3	<i>Feet.</i> 3.1	<i>Feet.</i> 1.6	<i>Feet.</i> 3.5	New Orleans and Crockett Point.	2	.....
								Not reported .....	.....	.....

a Towboat with 2 barges of 900 tons.

# APPENDIX X—REPORT OF CAPTAIN BROMWELL. 1383

## Summary of commerce reported for Tensas River and Bayou Maçon.

Articles.	1902-3.
Cotton .....	<i>Tons.</i> 2,465
Cotton seed .....	5,256
Hides and skins .....	1
Lumber .....	298
Staves .....	900
Miscellaneous .....	1,387
Total .....	10,307
Estimated value .....	\$682,300

During the fiscal year 1903, bayous D'Arbonne and Corney were reported navigable October 15, 1902, to June 1, 1903.

## List of boats engaged in the trade during the fiscal year.

Name.	Class.	Tonnage.	Length.	Breadth.	Depth.	Draft.		Between—	Round trips.	Passengers.
						Light.	Loaded.			
John B. Robinson..	Stern-wheel. Gasoline.	47	<i>Feet.</i> 90	<i>Feet.</i> 18	<i>Feet.</i> 3.5	<i>Feet.</i> 1.3	<i>Feet.</i> 3	Monroe and Farmerville..	.....	.....
Union a.....			.....	.....	.....	1.3	2.5	Monroe and Whiteoak....	3	.....

a With barge.

## Summary of commerce reported for bayous D'Arbonne and Corney.

Articles.	1902-3.
Cotton .....	<i>Tons.</i> 175
Cotton seed .....	170
Miscellaneous .....	337
Total .....	682
Estimated value .....	\$55,000

## REPORT OF MR. H. M. MARSHALL, ASSISTANT ENGINEER.

UNITED STATES ENGINEER OFFICE,  
Vicksburg, Miss., June 30, 1903.

CAPTAIN: I have the honor to report on improvement of Bayou Bartholomew, Boeuf River, Tensas River and Bayou Maçon, and Bayous D'Arbonne and Corney, Louisiana and Arkansas, for the fiscal year ending June 30, 1903.

## BAYOU BARTHOLOMEW.

Work for the maintenance of navigation in Bayou Bartholomew began at the mouth September 25, and was carried upstream 140.9 miles to McComb landing, the head of navigation, and back again by December 12, 1902. Mr. J. R. Vaughan, overseer, directed the work, which was carried on by means of saws, axes, tackle, and explosives. The party lived and moved on quarter boat No. 3, which was built at Camden, Ark., in the spring of 1897.



# 1384 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

The following obstructions were removed from the channel and banks:

Channel snags cut and destroyed .....	1,751
Logs removed from channel .....	199
Trees removed from channel .....	45
Jams broken up and destroyed .....	3
Side jams broken up and destroyed .....	5
Shore snags cut and destroyed .....	366
Stumps cut and destroyed .....	440
Logs cut and destroyed .....	1,405
Leaning trees felled and destroyed .....	829
Square yards of willows and brush cut .....	19,480

## BAYOUS D'ARBONNE AND CORNEY.

After work in Bayou Bartholomew was finished the party was transferred to Bayous D'Arbonne and Corney. Work began at Cobb Landing, which is 57 miles above the mouth of D'Arbonne and is the head of navigation on Corney. The water was too high for removing snags from the channel of Bayou D'Arbonne near the lower end, but it is only at high stages that a party quartered on a boat can get into Corney and the upper part of D'Arbonne. To begin at the upper end on a high stage and work down as the water falls is the proper method of carrying on the work. Of course it sometimes happens the water does not fall after work has commenced, as was the case this season. However, the upper bayous were well cleaned and the points in the lower portions were cleared of brush at the cut-offs, thereby removing the worst obstructions and giving the most benefit to navigation. The following work was done:

Channel snags cut and destroyed .....	161
Logs removed from channel .....	471
Trees removed from channel .....	74
Jam broken up and destroyed .....	1
Side jams broken up and destroyed .....	6
Shore snags cut and destroyed .....	78
Stumps cut and destroyed .....	74
Logs cut and destroyed .....	958
Leaning trees felled and destroyed .....	451
Square yards of willows and brush cut .....	4,889

## BOEUF RIVER.

After the boat was laid up with the plant at Monroe the hull leaked so much and it was found to be rotted so badly, a new hull was built and the cabin transferred to it. The material for the new hull, covering the roof, and painting the cabin cost about \$235. The work was done by the usual force employed caring for the boats while laid up, except two calkers a few days and some unskilled labor. On the 11th of June the dispatch boat left Monroe with the quarter boat in tow and on the 14th arrived at Charleville, 92.9 miles above the mouth of Boeuf River. The dispatch boat had to turn back, as the water was too low for her, and the quarter boat was corded to the Vicksburg, Shreveport and Pacific Railway bridge near Girard, 121.7 miles above the mouth. On the way up the river 26 logs and 10 stumps were removed from the channel and destroyed.

Point Jefferson, 29.1 miles above, has been considered the head of navigation, but no boat has been higher than Girard since that part of the stream was worked over in May and June, 1901.

No work was done during the last fiscal year on Tensas and Maçon, and the chopping party will be transferred to them after Boeuf River is worked over.

The following table gives the upper limit of survey, distances above the mouth of the stream, and the oscillation thereat:

Stream.	End of survey.	Distance.		Oscillation.
		Miles.	Fet.	
Bayou Bartholomew .....	Baxter, Ark .....	181.9	19.7	
Bayous D'Arbonne and Corney .....	Cobb Landing, La .....	57	31.2	
Boeuf River .....	Point Jefferson, La .....	150.8	26.6	
Bayou Maçon .....	Floyd, La .....	111.6	28.2	
Tensas River .....	Dallas, La .....	137.8	28.9	

The oscillation at the mouths is governed by Ouachita River, and is about 48 to 55 feet.

The work on these streams is directed toward increased safety to navigation, since they are navigable only during high stages from late autumn to early summer time, and then the depth is ample for boats of any draft. During low water they go almost dry in places.

If the maintenance of the 598 miles of navigable waters which constitute these rivers shall be by biennial appropriation, then \$20,000 should be provided.

Very respectfully, your obedient servant,

H. M. MARSHALL, *Assistant Engineer.*

Capt. CHAS. S. BROMWELL,  
*Corps of Engineers.*

## X 5.

### IMPROVEMENT OF MOUTH OF YAZOO RIVER AND HARBOR AT VICKSBURG, MISSISSIPPI.

The Atlantic, Gulf and Pacific Company, contractors for the work of excavation along the diversion route from Old River to Kleinston Landing, continued operations during the year with the plant described in the report of 1901. (See Report Chief of Engineers, 1901, p. 2063.) Hydraulic dredge No. 5 was withdrawn from active service July 3, 1902, and hydraulic dredge No. 4 ceased work November 26, 1902, at which time all material that could be removed by the hydraulic method was completed. The clam-shell dredge continued work the entire year.

The condition of the work under this contract at the close of the fiscal year ending June 30, 1903, was as follows:

The quantities of excavation since operations commenced, as measured for monthly payments to the contractors, have been as follows:

	Cubic yards.
November 19, 1900, to June 30, 1902.....	4, 694, 779
July 1, 1902, to June 30, 1903 .....	1, 055, 977
Total work for which payments have been made .....	5, 750, 756
Excavation in August, 1901, on which payment is withheld until completion of contract.....	11, 341
Total work performed to June 30, 1903 .....	5, 762, 097
Approximate quantity required to complete contract.....	55, 000
Total .....	5, 817, 097

Work under this contract was to have been completed between May 19 and June 17, 1903, but as the contractors were unavoidably delayed by the long-continued floods of the Mississippi River during the spring and summer of 1903, the time limit has been waived for a reasonable period under authority of the Chief of Engineers.

The work has been carried on under the local supervision of Mr. T. C. Thomas, assistant engineer, whose report is appended hereto, and to which reference is invited for full details and general information.

In a special report, dated June 28, 1902, Captain Potter discussed a plan for preventing the circulation of eddy currents and consequent deposits in Vicksburg Harbor and proposed the construction of a levee from a point near Kleinston Landing, on the accretion below the foot

1386 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

of De Soto Island, westward up the bank of the Mississippi River, and across the West Pass of Lake Centennial to high ground at or near King Point. In accordance with a suggestion of Captain Potter this plan was considered by a Board of Engineers July 25, 1902. The report of the Board and the action taken thereon are quoted below:

UNITED STATES ENGINEER OFFICE,  
Vicksburg, Miss., July 25, 1902.

GENERAL: The Board of officers of the Corps of Engineers, constituted by Special Orders, No. 21, Headquarters Corps of Engineers, Washington, July 11, 1902, has the honor to submit the following report:

The Board met on the call of the senior member at Vicksburg, Miss., July 25, and carefully considered the papers submitted to it. The Board proceeded upon a tug to the location of the proposed levee on the left bank of the Mississippi River, and up the canal to its head at Old River.

The Board met again at the U. S. Engineer office at Vicksburg to formulate its report.

After mature consideration of the matter the Board decided to recommend the approval of the project submitted by Capt. Chas. L. Potter, Corps of Engineers, for a levee along the left bank of the Mississippi River, the canal end of the levee to be turned toward De Soto Island for a distance of about 500 feet; the ground along the canal side of this spur, around its upper end, and 100 feet down the back side to be protected by a mat 80 feet wide, and the slope of the levee to be paved with stone throughout the same distance. This levee to be built to 4 feet above the highest recorded water, with an 8-foot crown and 3 to 1 slopes, and to be at first built to a point A on the extra blueprint submitted herewith, marked Plate 1A, and then, if the circulating current be found to still exist, the levee to be built on up toward Kings Point as far as may be necessary.

The Board considers it absolutely necessary that some means be undertaken to prevent the circulating eddy current which has existed in this harbor since the cut-off in 1876, and which, if allowed to continue, will result in heavy annual expense for dredging the material deposited thereby.

There are some features which the Board believes may be objectionable in this plan, but it considers it the most feasible means of preventing this flow. These features are as follows:

(a) This levee is on a concave bank of the Mississippi River, which generally means a caving bank, but in this case a narrow bar exists along this bank and it is not thought that caving will begin unless some decided change takes place above Delta Point, and in such an event some measures may have to be undertaken to protect this levee or throw it back to some other line.

(b) This levee being almost entirely built on deposit made in the old arms of the river, it is thought probable that it will settle considerably, but as there will be but little difference in water level on the two sides no serious result would follow if it should settle so as to be overtopped.

(c) It is possible that the Yazoo River when brought through by this canal may, in high water, take the western arm of the lake and discharge principally across the willow flat between the lower end of De Soto Island and this levee and cut a channel through that way, but the Board has decided to leave this matter for an after consideration and if found necessary the spur provided for at the canal end of the levee may be extended up to the lower end of De Soto Island.

The Board's estimate for the levee it recommends from the canal to the point A, including spur and protection is as follows:

444,665 cubic yards of earthwork, at 22½ cents.....	\$100, 050
Protection of spur at canal end—	
686 squares of mat, at \$5.....	3, 430
993 squares of paving, at \$9.75.....	9, 682
Engineering and office, about 10 per cent.....	11, 838
Total.....	125, 000

The Board places this higher price for earthwork on account of the fact that this is the highest portion of the levee proposed by Captain Potter and the most difficult to construct.

The Board then considered the project submitted by Capt. Charles L. Potter, Corps of Engineers, for the construction of a levee on the south side of the main cut, between Old River and Lake Centennial.

The Board recommends that this project be approved as outlined by Captain Potter, the levee to be built 1 foot above the highest recorded water, with an 8-foot crown and 3 to 1 slopes.

There being no further business before it the Board adjourned sine die.

Respectfully submitted.

AMOS STICKNEY,  
*Colonel, Corps of Engineers.*  
J. H. WILLARD,  
*Major, Corps of Engineers.*  
CHAS. L. POTTER,  
*Captain, Corps of Engineers.*

Brig. Gen. G. L. GILLESPIE,  
*Chief of Engineers, U. S. Army.*

OFFICE OF THE CHIEF OF ENGINEERS,  
UNITED STATES ARMY,  
Washington, August 2, 1902.

CAPTAIN: Referring to your letter of June 28, 1902, relative to project for improving mouth of Yazoo River and harbor at Vicksburg, Miss., there is inclosed for your information a copy of report on the subject dated July 25, 1902, by Board of Engineers, constituted by Special Order, No. 21, Headquarters Corps of Engineers, current series.

The views and recommendations of the Board are approved.

Please return the blueprint to this office when such record as may be necessary shall have been made.

By command of Brigadier-General Gillespie:

Very respectfully, your obedient servant,

A. MACKENZIE,  
*Colonel, Corps of Engineers.*

Capt. CHAS. L. POTTER,  
*Corps of Engineers.*

(Through Col. Amos Stickney, Corps of Engineers, senior member of Board of Engineers, and Lieut. Col. H. M. Adams, Corps of Engineers, Division Engineer, Gulf Division.)

Construction of the levee has been delayed by several causes. The question of limits of ownership of the lands required for the right of way was very complicated, and it was uncertain whether certain lands were situated in Mississippi or Louisiana. The reputed owners were willing to grant the right of way for a reasonable compensation, but, as there appeared to be no other way to adjust the complications, the Secretary of War, under date of November 11, 1902, authorized the acquisition of the lands needed by condemnation, and requested the Attorney-General to instruct the proper United States district attorneys to take the necessary action in the matter. In accordance with this request, two judgments were taken January 12, 1903, in the circuit court of the United States for the southern district of Mississippi, awarding compensation for the lands within the boundary of Mississippi, but, so far as this office has information, no action has been taken for condemnation of the part situated in Louisiana.

Licenses were given by the owners of the lands consenting to the construction of the levee, pending the proceedings for expropriation, which were submitted to the Judge-Advocate-General, who gave an opinion November 25, 1902, that there was no legal objection to such construction before title was acquired. By that time, however, the season was too far advanced to attempt construction before high water, and the repeated and long-continued floods of the Mississippi have prevented its commencement. Specifications have been approved and proposals were invited by advertisement June 29, 1903, with the expectation of letting the work by contract and completing it by or before December 1, 1903.

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*Money statement.*

July 1, 1902, balance unexpended .....	\$401, 507. 28
June 30, 1903, amount expended during fiscal year .....	159, 958. 99
July 1, 1903, balance unexpended .....	241, 548. 29
July 1, 1903, outstanding liabilities .....	5, 245. 28
July 1, 1903, balance available .....	236, 303. 01
July 1, 1903, amount covered by uncompleted contracts .....	6, 820. 00

## LIST OF APPROPRIATIONS MADE.

July 13, 1892 .....	\$75, 000
August 18, 1894 .....	225, 000
August 18, 1894 .....	40, 000
June 4, 1897 .....	350, 000
March 3, 1901 .....	510, 000
Total .....	1, 200, 000

## ABSTRACT OF CONTRACT IN FORCE.

Name of contractor: Atlantic, Gulf and Pacific Company.  
Rate per cubic yard: 12.4 cents.  
Date of approval: August 10, 1900.  
Date of beginning work: November 19, 1900.  
Date of expiration: Probably not later than August 1, 1903.

## COMMERCIAL STATISTICS.

For commercial statistics see Yazoo River and its tributaries

## REPORT OF MR. T. C. THOMAS, ASSISTANT ENGINEER.

UNITED STATES ENGINEER OFFICE,  
Vicksburg, Miss., June 30, 1903.

CAPTAIN: I have the honor to submit report on survey and dredging operations in the Yazoo River diversion canal during the fiscal year ending June 30, 1903.

## SURVEY.

In addition to the routine work of staking out excavation for the dredges, and sounding for the monthly estimates, the survey party located and cross-sectioned a proposed levee from the mouth of the canal up the left bank of the Mississippi River to the vicinity of King Point. A second levee was located—and cross-sectioned—along the training dike on the south side of the main cut of canal from Old River to the main west bank of Lake Centennial. The object of the first levee is to prevent the Yazoo, after deflection through the main cut, from flowing down the west branch of Lake Centennial and into the Mississippi River across the low neck of land at the south end of the west branch of the lake, as it now does at stages from medium to high. The second levee is designed to prevent a crossflow in the main cut from north to south, in case of general overflow of the adjacent country. A low-water survey was made (November) at the present mouth of the Yazoo from deep water in the Mississippi across the shoals at the mouth of the Yazoo, and well up into the latter stream. Shore lines were located, cross sections taken at short intervals, and slope levels run. A similar survey was made (December) at the junction of the Yazoo with Old River, the survey being extended 1 mile down the "live end" of Old River and one-half mile down the Wrong End. A survey was made

(November) along the left bank of the Mississippi from King Point to the mouth of the canal, the flat bar in front of the main bank being cross-sectioned by transit levels out to water's edge, and the cross sections extended out to the channel line by soundings. This is the first of a series of comparative surveys designed to show the progressive changes that may occur here. A check line of precise levels was run (December) over the above stretch, and a series of 13 high-water gauges set, to determine the limits of the negative slope due to the eddy in the Mississippi at the mouth of the canal.

Surveys to determine omissions in dredging and changes in the excavated channel of canal were made as follows:

July: Soundings taken in the stretches of canal lying in Barnett Lake and in Old River and the harbor division sounded longitudinally, from a barge carried broadside up and down the canal several times, in a search for mud lumps. September: Sounded the portion of the main cut between Lake Centennial and Barnett Lake from skiffs placed so as to clear oars, and pulled abreast over the canal several times; later the harbor division was resounded to determine fill. November: Took longitudinal soundings in the main cut from Barnett Lake to Old River, testing the channel for mud lumps and fill. December: Cross-sectioned harbor division before and after cutting the Jackson Street dike to determine changes due to draining the Lake Centennial pool through this stretch of canal. February: Cross-sectioned canal from the mouth through the harbor division and east branch of Lake Centennial to deep water in the lake, and from the west end of Barnett Lake to deep water in Old River; longitudinal soundings were taken through the main cut out from Old River to deep water in Lake Centennial. May: Cross-sectioned the main cut out from main bank of Lake Centennial to Old River, and the Old River division of canal from head of main cut northward to deep water; also sounded, longitudinally, the portion of the main cut lying east of the main bank of Lake Centennial.

The slope gauges along the Mississippi were read daily during the high-water period, and a series of gauges along the canal, from its mouth to Old River, were read about twice a week during the same time. Daily readings have been taken on gauges at mouth of canal in Lake Centennial near head of De Soto Island, and in Old River near head of main cut since the opening of the canal in December.

#### DREDGING.

Hydraulic dredge No. 5 (Atlantic, Gulf and Pacific Company) worked in harbor division of canal July 1 to 3, 1902. This dredge was then laid up for repairs, and left for Savannah, Ga., November 5, 1902. Hydraulic dredge No. 4 worked in the harbor division of canal July 1 to 5. July 8 this dredge was taken to the Wrong End of Old River via Yazoo River, and began excavating a temporary lock chamber in the neck of land left at the head of the main cut of canal. This lock was designed to transfer the dredge, quarter boat, and pontoons to the Lake Centennial pool. The chamber was practically completed on July 18, when this dredge was laid up by order of the president of the contracting company. Work was resumed on the 25th, and the quarter boat, etc., brought into the lock chamber on the 29th, when a back fill was begun with the dredge to dam the opening from the chamber into Old River. The dam was brought above water surface the following day by a barrow fill, and on July 31 the dredge dug from the chamber out into the main cut of canal an arm of the Lake Centennial pool. The water surface in Old River fluctuated slightly below and above the pool level during the time of locking through. During early part of August No. 4 dug in the east branch of Lake Centennial from deep water to the mouth of Glass Bayou; later in the main cut between Barnett Lake and Old River, taking the wide superficial cut of former months down to grade. On completing this work (September 13) No. 4 dug in the batture east of the main west bank of Lake Centennial, finishing up a short stretch left uncompleted by the clam-shell dredge on account of the large amount of quicksand encountered. From the early part of October to the latter part of November the dredge worked over the whole main cut with the exception of a short stretch (stations 128½ to 133 worked over in September), removing fill and mud lumps, and trimming channel out to full width. This dredge was laid up November 26 for general repairs, and left for Mobile, Ala., January 5, 1903.

The clam-shell dredge *California* worked in the main cut east of Barnett Lake, July 1 to August 9, deepening and widening the channel excavated by the hydraulic dredges during the previous fiscal year. This dredge was then transferred to the east branch of Lake Centennial, and carried the cut begun by dredge No. 4 southward from Glass Bayou to the impounding dike at Jackson street, reaching latter point in the early part of December. The dike was cut December 10, when the Lake Centennial pool stood 3.6 feet above the water in the harbor division, as backed

## 1390 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

up the canal from the Mississippi River. The lake fell 1.4 feet, when the declining pool and rising river came to a common level (December 13), and a back flow began. The opening in the dike scoured very little, on account of the blue clay or buckshot of which it was composed; and the clam shell remained there until December 21, widening and deepening the breach. The *California* was then taken to the head of the main cut, and began taking out the dam left at that point between the pool and Old River, it being deemed advisable to turn the Yazoo water down the main cut into Lake Centennial and thus check the slow flow from the Mississippi River—and the attendant sedimentation—in the harbor division of the canal. The dredge continued at the head of main cut until February 16. In the meantime the Mississippi had risen to a stage considerably higher than the neck of land at West Pass, and a strong current from lake to river developed there. This current became stronger after the river began to decline (January 7), and, concentrating across the lower part of the neck as the river fell, made it probable that a breach would be formed. The dredge was therefore brought back to Jackson street and began enlarging the opening in the dike at that place, to afford a more ample section of discharge from the lake to the river, and thus relieve West Pass. The West Pass neck came out January 25, and the stage in Old River dropped until navigation through the main cut was suspended on account of the inadequate cross section of ingress at its head. Work was therefore resumed at this point January 27, and continued to March 8, when the cross section at the head of the main cut was completed to full width and grade. The dredge then completed the excavation at Jackson Street dike, and removed a ridge crossing the bottom cut of canal at foot of Clay street, left by the hydraulic dredges on account of a sunken barge of stone encountered there. The dredge then removed back fill from the harbor division of canal March 29 to June 10 and from the stretch of canal in east branch of Lake Centennial June 10 to 30, 1903.

The only important single stop for dredge No. 4 prior to her permanent withdrawal from this work was from July 18 to 25, as already referred to, but during the latter part of November the engine hours were cut down considerably on account of scarcity of fuel. The clam shell was laid up from August 22 to 25 replacing the casing to a spud well, and from September 7 to 12, excepting fifteen engine hours on the 10th, repairing boom and dipper. November 22 to 26 the dredge laid at the contractors' sidetrack, near the National Cemetery, loading heavy machinery for shipment. The dredge shut down again from January 1 to 8, except six and one-half hours on the 5th, on account of damaged friction drum and broken crosshead on spud engine, and from March 7 to 11 repairing hoisting gins. November 17 to 21 this dredge worked during the day watch only, on account of fuel scarcity, and during January, February, and the greater part of March the digging was in strong currents, and the difficulty in maneuvering dredge and mud scows under these circumstances caused a heavy loss of time. Spuds were broken faster than they could be replaced, and from February 28 to March 2 the dredge was held in position and maneuvered by anchors and lines alone, every spud being broken. The stern spud was then replaced, but during the remainder of the fiscal year the dredge has been maneuvered by cables running to anchorages planted on either side, swinging the dredge on the stern spud, the operators preferring this method to that of handling with port and starboard spuds. The January and February outputs are the lowest in the record of the dredge.

The dredge worked with the little dipper (2½ yards) from September 28 to November 2 and from February 18 to 23, pending repairs to the 5½-yard dipper. The 7-yard dipper was not used.

TABLE I.—Statement of excavation by localities.

Limiting localities.	Excavation during fiscal year—			Total.
	1901.	1902.	1903.	
Mississippi River to Jackson street dike .....	<i>Cubic yds.</i> 1,026,743	<i>Cubic yds.</i> 470,881	<i>Cubic yds.</i> 251,272	<i>Cubic yds.</i> 1,748,896
Jackson street dike to deep water in Lake Centennial .....			332,696	332,696
Deep water in Lake Centennial to east end of Barnett Lake .....	845,021	802,532	208,393	1,855,946
Barnett Lake east to west end .....		713,927	17,507	731,434
West end Barnett Lake to bank of Old River .....		744,717	246,110	990,827
Bank of Old River to deep water in Old River .....		102,299		102,299
Total .....	1,871,764	2,834,356	1,055,977	5,762,097

APPENDIX X—REPORT OF CAPTAIN BROMWELL. 1391

In the above table the first stretch constitutes the harbor division of canal; the second lies in the east branch of Lake Centennial; the third, fourth, and fifth make up the main cut, and the last lies in the Wrong End of Old River. The excavation given is exclusive of 319,275 yards in the harbor division between the mouth of canal and station 36, and 17,083 yards in the Old River stretch of canal, no estimate being given the contractor for these, the first falling under a special agreement with the contractor (see Report Chief of Engineers, 1901, p. 2059), and the second being traceable to the discharge of material into Old River during December, 1901. There is included in the table 186,055 yards of fill in the harbor division, and 29,081 yards of fill in the east branch of Lake Centennial, removed at Government expense, leaving a total of 5,210,603 yards of original excavation. The canal has been dredged to the grade and cross section contemplated in the plan adopted in February, 1902 (see Report Chief of Engineers, 1902, p. 1422). About 50,000 yards of recent fill remain to be removed from the main cut, and several thousand yards of fill will probably have to be removed from the mouth of the canal before considering the work finished.

TABLE II.—*Monthly output and general conditions under which dredging was done.*

DREDGE NO. 4.

Month.	Output.	Engine hours.	Average—		Ruling material and remarks.
			Pipe line.	Lift.	
1902.	<i>Cu. yds.</i>		<i>Feet.</i>	<i>Feet.</i>	
July .....	64,548	331	1,070	6	Gray and brown clay and sandy loam.
August .....	116,054	564	1,237	15	Silt, clay, sand, and gravel.
September .....	96,862	586	1,749	12	Blue and gray clay, sandy clay, sandy loam, and fine sand.
October .....	108,357	558	1,840	10	Fine sand, soft silt, some gray clay. Dredge cleaning up channel and moving a great deal.
November .....	94,262	427	1,108	17	Fine sand, soft silt, gray and brown clay. Dredge cleaning up channel and moving a great deal.
Total and average	469,083	2,466	1,400	12	

DREDGE NO. 5.

1902.					
July .....	15,219	66	1,389	14	Dark clay (a soft buckshot).

CLAM-SHELL DREDGE CALIFORNIA.

Month.	Output.	Engine hours.	Average haul.	Capacity of dipper.	Ruling material and remarks.
1902.	<i>Cu. yds.</i>		<i>Miles.</i>	<i>Cu. yds.</i>	
July .....	50,800	435	1.5	5½	Sand, silt, and mud.
August .....	63,275	436	1.6	5½	Sand, stiff mud, sandy silt, and loam.
September .....	70,642	324	1.6	5½	Sandy silt, with some gravel and clay.
October .....	60,466	516	1.8	2½	
November .....	49,010	298	2	2½	Sandy silt, soft and stiff loams, some gravel, brush, and fragments of piling.
December .....	43,463	334	2.2	5½	Sandy silt, soft loam.
1903.					
January .....	16,783	252	2.2	5½	Sandy silt, gray clay, brush, and fragments of piling.
February .....	10,256	262	2.8	5½	Hard gray clay, loam, some sand. Dredge working in swift current.
March .....	25,380	280	.7	5½	Hard gray clay, some loam, and sand. Dredge working in swift current.
April .....	58,847	362	.8	5½	Gray clay, silt, and sand, fragments of limestone (at foot of Clay street).
May .....	76,360	370	1.2	5½	Soft loam and sandy silt.
June .....	46,393	325	1.1	5½	Sand, sandy silt, and soft loam.
Total and av'ge ..	571,675	4,194	1.6	.....	Soft silt.



## DISPOSITION OF MATERIAL.

Hydraulic dredge No. 5, during her three days of active operations, deposited dredged material along the lake side of the impounding dike west of the harbor division of canal.

Hydraulic dredge No. 4, while working in the harbor division (July 1 to 5), wasted her material on the willow flat on the west; and in Old River, while excavating the temporary lock chamber at the head of the main cut (July 8 to 31). While digging in the east branch of Lake Centennial (August 2 to 9), No. 4 wasted in that arm of the lake about 900 feet west of the canal cut; afterwards, while deepening the western end of the main cut, she discharged on the land side of the training dike on south side of canal, broadening the old fill from station 183½ to station 191 (August 10 to 26). The water discharged with the material now began to back into the cultivated fields on the Old River front, and, the adjacent stretch of training dike being already above high water, the dredge began discharging into Old River at a point 500 feet south of the head of the main cut (August 27 to September 14). While deepening the cut through the batture, immediately east of the main west bank of Lake Centennial, the dredge discharged on the approach to the Lake Centennial dam (September 15 to October 8). While trimming up the main cut, during October and November, the dredge wasted her material in Lake Centennial, about 900 feet south of the canal; deposited it on the approach to the Lake Centennial dam; placed it along the land side of the training dike on south side of canal, and wasted it in the low swamp along the north bank of Barnett Lake and in Old River. Material moved by the clam-shell dredge *California* was scowed to the Lake Centennial dam from July 1, 1902, to January 13, 1903, and January 22 to February 15, 1903. During February, while dredge was working at head of the main cut, 3,934 yards were deposited in the live end of Old River about 1,000 feet below the true mouth of the Yazoo. At other times, during January, February, and March, when the heavy current at the head of the main cut made it impracticable to maneuver the scows, the dredge dug and threw over 6,666 yards, and for several days in January, when the dredge tender *Berenice* was practically disabled, material was wasted in the Wrong End of Old River, about 700 feet south of the head of the main cut, 792 yards being thus disposed. January 17 to 21, while dredge was enlarging the cut at Jackson street dike, the material was deposited across the old bed of Glass Bayou about 700 feet west of the canal. This dumping ground was again used June 2 to 30, while the dredge was removing fill from the stretch of canal in the east branch of Lake Centennial. During March and April advantage was taken of the high stage to deposit 62,164 yards in Steamboat Slough, raising and broadening the impounding dike built by the contractors across this slough. Later, material was deposited in the old channel of West Pass and in the crevasse, 600 feet west of the pass on the river side of the dams across these outlets.

The material deposited along the training dike on south side of the main cut has not raised the crest of that dike except at a few points, having been applied to broadening the old fill. The October levels over this dike show the crest to be at an average elevation of about 100 feet above mean Gulf level, or practically 1 foot above local high water for the first 700 feet from Old River. Thence to west bank of Barnett Lake the crest averages at about 90 feet, mean Gulf level, with several depressions near the lake, the lowest of these being at 84 feet, mean Gulf level. Across Barnett Lake the dike averages at 82 feet, mean Gulf level, being practically as found on June 20, 1902, showing that the marked settlement noted during the construction of this stretch has ceased. The stretch from Barnett Lake to the main bank of Lake Centennial averages between 89 and 90 feet, mean Gulf level, and is fairly regular. The crest of the dike is wide enough, in the general case, for the base of an enlargement levee to extend above local high water.

The crest of the Lake Centennial dam averages at about 62 feet, mean Gulf level, with the exception of a stretch of 250 feet at the De Soto Island end, where the dam drops gradually to 51 feet mean Gulf level at the bank of the island. This depression was left as an outlet for the west branch of the lake at stages below the level of the West Pass neck as a precaution against the formation of a breach in some other portion of the dam.

Before the impounding of water in Lake Centennial, Glass Bayou—a tributary from the east—flowed nearly across the east branch of the lake, between the Jackson street dike and a low ridge 1,000 feet north of the dike, then turned northward and emptied into the lake near De Soto Island. The fill in this old bayou bed, already referred to, was made to concentrate the low-water discharge in the canal cut through the ridge on the north. On June 29 the average elevation of the fill was 75 feet, mean Gulf level, with a fairly uniform crest, the northward ridge having an elevation of

73 feet where crossed by the canal. The fill in Steamboat Slough was made as a precaution against the formation of an alternative channel through the slough, between the west branch of Lake Centennial and the harbor division of the canal. The crest of the fill averaged at 81 feet, mean Gulf level, June 27, the original bed of the bayou running at about 63 feet. The fill in the old outlets from the west branch of Lake Centennial to the Mississippi River was made to strengthen the dams at these places and to furnish, in conjunction with the dams, a base for the proposed levee along the neck separating the lake and river. The fill at West Pass averages, roughly, at 78 feet, mean Gulf level, or about 1 foot above the crest of the dam at that place. The fill at the crevasse rises to about 73 feet, mean Gulf level, 5 feet lower than the crest of the dam against which it is made.

TABLE III.—Disposition of material, November 19, 1900, to June 30, 1903.

Where disposed.	Used in construction.	Wasted.
	<i>Cubic yards.</i>	<i>Cubic yards.</i>
In the crevasse, 600 feet west of West Pass.....	75,088	
In West Pass.....	64,761	
In Mississippi River at mouth of canal.....		71,760
On impounding dike west of harbor division of canal.....	502,869	
In flat west of harbor division of canal.....		1,022,696
On dam across Steamboat Slough.....	321,227	
On dam across old bed of Glass Bayou.....	28,859	
In east branch of Lake Centennial.....		30,259
On dam across west branch of Lake Centennial.....	888,160	
In Lake Centennial at east end of main cut of canal.....		18,018
On approach to Lake Centennial dam.....	424,431	
Wasted behind approach.....		89,830
On training dike, main bank of Lake Centennial to Barnett Lake.....	349,063	
Wasted behind this dike.....		297,740
On Barnett Lake dam.....	228,902	
Wasted behind this dam.....		148,417
Wasted in swamp north of Barnett Lake.....		55,691
On training dike, Barnett Lake to Old River.....	338,777	
Wasted behind this dike.....		416,520
Dug and thrown over at head of main cut of canal.....		6,666
Wasted in Old River, south of head of main cut.....		591,266
Wasted in Old River, west of canal cut.....		124,537
In live end of Old River, below true mouth of Yazoo River.....	3,934	
Total.....	3,225,561	2,872,894

PROTECTION WORK AT WEST PASS.

An outlet between the west branch of Lake Centennial and the Mississippi River was maintained from the early 80's to 1899, being annually scoured out by the drainage from the lake. This outlet, known as West Pass, was closed by a dam built by the United States engineers in latter part of 1899; but during the succeeding high water a new outlet was formed about 600 feet west of the former one. This outlet, known as "the crevasse," was closed by the Atlantic, Gulf and Pacific Company, contractors for excavation of the canal, during the high water of 1900-1901. During the high water of 1901-2 considerable trouble was experienced in holding the spillway built by the contractors at the West Pass dam, and the receding water left the spillway in such bad condition that it was removed, and the opening filled up. Previous to the last high water it was thought advisable to protect, in some manner, the neck of land adjacent to the two outlets, this being the lowest portion of the ridge separating the lake and river. A post and plank bulkhead, 2½ feet in height, was built in December, extending from a point about 300 feet east of West Pass to a point 300 feet west of the crevasse, about 1,200 feet in total length. The posts (4 by 4 inches by 8 feet) were set 5½ feet in the ground at 4-foot centers. The sheathing (1 by 12 inches by 12 feet) was put on horizontally, with the bottom plank set one-half foot in the ground. To prevent underscour, sacks of earth were placed on either side of bulkhead, a layer of headers at bottom with a row of stringers on top. As a drop over the dam of more than one-half foot was not anticipated, it was thought that a water cushion of 2½ feet on the lower side of bulkhead would be sufficient to prevent scour. The bulkhead went under three successive times (December 22, February 13, and May 30), and came out twice (January 22 and May 25). On June 30 the lowest point of the bulkhead was about 10 feet under water.

During the greater part of the high-water period a small force has been kept at West Pass maintaining a night and day patrol from mouth of canal to the woods on

the west of Lake Centennial, reading the adjacent slope gauges, etc. A considerable number of sacks were filled with earth on the south end of De Soto Island, the nearest high ground, and a hand pile driver was built and mounted on a small catamaran, and held in readiness at the pass. On May 18 a breach was discovered in the bulkhead at a point immediately west of the crevasse by the absence of the ripple then showing over the higher part of the bulkhead. An examination showed that about 70 feet of the protection work had been carried away and a hole about 10 feet deep scoured in the breach. A special force was employed and material collected at once. On the following day the break was closed by a run-around of piling driven at 4-foot centers with a sheathing of planks shoved down in the water and held in place by banking against them with sacks of earth. The hole scoured in the breach has been practically filled by material dumped from the mud scows during the June rise.

#### NATURAL CHANGES IN CANAL, ETC.

From July to early part of December the harbor division of canal was isolated from the Lake Centennial pool, the water level being below the crest of the impounding dikes at Jackson street and in the willow flat on the west of this stretch of canal. There was no current through the harbor division during this period; nevertheless, the greater part of the fill during the fiscal year materialized during this time, as shown by the December soundings. During November and early part of December the pool level was lowered about 3 feet by a system of drainage pipes laid in the Jackson street dike. The rate of discharge was too small to cause a perceptible current down the canal. The dike was cut December 10, and the lake fell an additional foot and four-tenths between that date and the 13th, but without producing a perceptible current in the canal. A back flow into the lake began on the latter date and continued until the night of December 21-22, when the discharge into the lake through the opening just made between Old River and the main cut turned the current outward through the harbor canal. This direction of flow was maintained until the latter part of December, when the river stage being well above the level of the West Pass neck, practically all the Yazoo discharge passed down the west branch of the lake to the Mississippi, and the current on the city front became alternating in direction, or nil—always feeble. This continued until January 8, when the declining river stage reduced the cross section of discharge at West Pass to such an extent that the Yazoo discharge was again trained into the harbor division of the canal and a marked outward current developed. The main rise of 1902-3 began February 4 and continued to March 27, when the Kleinston gauge read 51.8 feet. The outward current in the harbor canal continued until February 21, when West Pass was submerged to a depth of 10 feet. On the 24th an inward current developed in the first 3,000 feet of the canal, the flow returning to the Mississippi through the willow flat on the west. Farther up the harbor canal there was practically dead water. On March 7, however—the river still rising—an outward current developed in the harbor division, and continued to June 30. This current reached a velocity of about 2 miles per hour, at the maximum river stage, which velocity was maintained during the period of decline, to 30.8 feet on the gauge (May 27), then fell off to about three-tenths mile per hour during the highest part of the succeeding rise (43.2 feet, June 26-28). During the main high-water period there was a slow flow from the west branch of the lake toward the canal, diagonally across the intermediate willow flat. During the same period the flow through Steamboat Slough was generally to the south, but never strong. During the several periods when the West Pass neck was submerged there was a very strong current from the lake to the river at this place.

The Yazoo discharge, however, even with free flow across West Pass, practically stopped the circulating current up the harbor canal and back to the river via the west branch of the lake, an inward current along the city front being only occasionally observed during the last high water, as against eighty-four days of inflow during the high water of 1900-1901, and sixty-seven days during that of 1901-2.

The overflow of the country adjacent to the main cut of canal began February 15, when the low ground near Barnett Lake was covered, and became general March 7, when the banks of the Wrong End of Old River were overtopped. At the maximum stage the overflow was about 6 feet deep at the head of the main cut, 16 feet deep along the north bank of Barnett Lake, 14 feet deep over the main bank of Lake Centennial, and 26 feet deep over the willow flat at the east end of the main cut. Short stretches of training dike on both sides of main cut, at head, remained above water, but the greater part of the dikes on either side were covered to a depth of 8 feet or more, while the dam across the south branch of Barnett Lake was 16 feet under water. A strong flow was maintained through the dredged channel of the main cut during the whole period of overflow. The flow across country on the north

was parallel to canal, in the general case, the exceptions being at the mouth of Cattail Slough and in the willow flat at east end of main cut, where, at times, slow currents were observed flowing diagonally toward the canal. There were no lateral currents from the canal into the country on the south except at Barnett Lake and in the willow flat at the east end of the cut. In the first case the current left the canal between the center and the east bank of the south branch of lake, and flowed diagonally into the woods on the east side of lake. In the south end of this lake the water was generally dead, but at times a slow flow, about parallel to canal, was observed. In the low willow flat at east end of the main cut the water deflected from the canal, flowed in a direction making an angle of about  $30^\circ$  with the axis of the canal, looking downstream. Double floats, reaching to various depths, set out at head of the main cut, were generally drawn out of canal at Barnett Lake, or at some point of the willow flat at east end of the cut, but a number of them floated through the dredged channel into the open water of Lake Centennial. Nowhere in the main cut was a current observed flowing across the canal proper.

Since opening the canal in December practically all the Yazoo discharge has been deflected through the main cut into Lake Centennial. A slow outward current was noted in the live end of Old River during latter part of January and early part of February, the Mississippi River being on a decline at the time, but the outward current is referable to the inadequate cross section of ingress at the head of the main cut. Since the enlargement of this cross section to full width and depth inward currents have been observed in the live end of Old River during periods of rise in the Mississippi, and practically dead water during declining stages, except near the mouth of the live end, where an outward current was observed at times during the period of general overflow, probably due to the cross-country flow from Pawpaw Island Chute, immediately above.

The fill in the harbor division of canal between the cessation of dredging in July, 1902, and the return of the clam-shell dredge to this part of the work in March, 1903, was 12 feet deep at the mouth of canal, dropping to 8 feet at station 17 (2,800 feet in), then continued with rather irregular values to some distance above the elevator, the limits being 5 feet and 7.5 feet. Thence to the head of the harbor division the fill was about 3 feet. Through the east branch of Lake Centennial the fill was practically the same as in the inner end of the harbor division, except at the mouth of Glass Bayou, where the depth of fill increased to 5 feet. One hundred and sixty-four thousand nine hundred and twenty-seven yards of fill were removed from the harbor division and 29,081 yards from the east branch of Lake Centennial during April, May, and June. Recent soundings in the harbor division show the channel to be practically as redredged.

The stretch of canal in Old River is practically as dredged in May and June, 1902, for the first 2,600 feet south from deep water in the river; thence to head of the main cut a slight fill is indicated by the May (1903) soundings. In the first 1,600 feet of the main cut, Old River end, a heavy scour has taken place, with a marked widening on the left bank near head of cut, which shifts to the opposite bank farther down. Thence to Barnett Lake a slight fill is indicated, bottom being about  $1\frac{1}{2}$  feet above grade in the general case. Through Barnett Lake a fill of 2 to 3 feet has taken place, and bottom is about 2 feet above grade, this stretch having been dredged well below grade in November. In the first 800 feet below Barnett Lake some fill is indicated, with bottom slightly above grade; for the succeeding 2,000 feet the channel is practically as dredged; thence for a distance of 1,500 feet some fill is noted, most pronounced at Cattail Slough, and bottom rises somewhat above grade. From this point to the main bank of Lake Centennial considerable scour has taken place, with a shifting of the channel to the right—bottom well below grade. For the first 300 feet east of the main bank of lake marked scour has taken place on the right, the cut being widened about 75 feet on that side, with bottom below grade. For the succeeding 700 feet the same widening on the right is noted, with a fill of about 6 feet across the bottom. The stretch of 1,300 feet next following shows a fill averaging 7 feet, with a maximum of  $10\frac{1}{2}$  feet at station 123. From the eastern limit (station 120) of the last-named stretch to deep water in lake the canal is practically as dredged.

The low-water depth in the canal, as calculated from the excavated cross section, slope, and minimum discharge (of Yazoo River) is 6 feet; and the minimum low-water width, 95 feet. It is not to be anticipated that the canal will remain excavated in length or in cross section, and the distribution of slope will be changed by the formation of the pools and shoals characteristic of alluvial streams. There is good reason to believe, however, that the depth over the shoals that may develop will be ample for boats capable of navigating the Yazoo River at low stages in that stream. The variation between mean low and mean high water in the canal will be from 40 to 45 feet.

# 1396 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

A map showing the route of the canal from the Mississippi River to Old River, showing impounding dikes, training dikes, and proposed levees, is published in the Report of the Chief of Engineers for 1902, page 1422; and a map showing the Yazoo, Old, and Mississippi rivers is published in the Report of the Chief of Engineers for 1894, page 1494.

Very respectfully, your obedient servant,

T. C. THOMAS, *Assistant Engineer.*

Capt. CHAS. S. BROMWELL,  
*Corps of Engineers.*

## X 6.

### IMPROVEMENT OF YAZOO, TALLAHATCHIE, AND BIG SUNFLOWER RIVERS, AND TCHULA LAKE, MISSISSIPPI.

The river and harbor act approved June 13, 1902, contained a general appropriation for continuing improvement and for maintenance of the works of improving Yazoo, Tallahatchie, and Big Sunflower rivers, with a provision that not exceeding \$4,000 should be used for the removal of obstructions at the lower end of Tchula Lake.

During the fiscal year ending June 30, 1903, operations were as follows:

#### (a) YAZOO RIVER.

The U. S. snag boat *Columbia*, James H. Britton, master, removed the following obstructions to navigation:

Snags pulled .....	346
Stumps pulled, cut, and destroyed .....	183
Shore snags cut .....	54
Logs removed from channel .....	12
Jam broken up and destroyed .....	1
Leaning trees felled .....	50
Trees girdled .....	23
Wrecks removed (sunken barge at Holly Bend, and part of cabin of steamboat <i>Emma Francis</i> at Sheppardtown) .....	2

After suspending operations in Tchula Lake, the party which had been employed in that stream, under Overseer James H. Bobbs, worked down the Yazoo River to mouth of Big Sunflower River and destroyed the following obstructions to navigation:

Channel snags removed .....	142
Shore snags cut .....	1, 423
Stumps cut .....	183
Leaning trees felled .....	1, 735
Square yards of willows and brush cut .....	91

#### (b) TALLAHATCHIE RIVER.

The U. S. snag boat *Thos. B. Florence*, T. G. Ledbetter, master, removed the following obstructions to navigation between the mouth of Tallahatchie River and Swan Lake, viz:

Snags pulled .....	591
Stumps pulled and destroyed .....	522
Shore snags cut .....	1, 840
Logs removed from channel .....	137
Jams broken up and destroyed .....	9
Side jams broken up and destroyed .....	15
Leaning trees felled .....	588
Trees girdled .....	192
Square yards of willows and brush cut .....	3, 275

## (c) BIG SUNFLOWER RIVER, MISSISSIPPI.

The snag boat *Columbia* removed obstructions to navigation and built wing dams to contract the channel and scour the bars in Big Sunflower River, from its mouth upstream to Holland Landing, as follows:

Snags pulled .....	221
Stumps pulled .....	38
Shore snags cut .....	140
Logs removed from channel.....	32
Linear feet of wing dams built .....	2,745

## (d) TCHULA LAKE.

A party equipped with tools, tackle, explosives, etc., worked over the lower part of the lake, from a point about 2 miles above Marcella to the mouth, during the period of lowest water, and removed the following obstructions to navigation, viz:

Snags pulled .....	14
Shore snags cut .....	2,884
Logs removed from channel.....	2,496
Jams broken up and destroyed.....	17
Side jams broken up and destroyed.....	6
Leaning trees felled .....	30,456
Leaning trees topped .....	1
Trees girdled .....	11
Square yards of willows and brush cut .....	3,230

Details of the year's work are given in the appended report of Asst. Engineer T. C. Thomas.

Operations were suspended by high stages in December, 1902, and conditions have not been favorable for resuming work since. As soon as there is reasonable probability of continued low water snagging operations, etc., will be resumed.

Reference is invited to the estimate heretofore made for a steel-hull snag boat to replace the *John R. Meigs*, destroyed September 3, 1898. The *Columbia* is a small wooden-hull boat (practically rebuilt three times since its purchase in 1888), which was transferred from the improvement of Ouachita and Black rivers for temporary use in Yazoo River and tributaries. The *Florence* is an iron and steel boat, smaller than the *Columbia*, and was transferred from the Red River improvement to aid in the work. Neither vessel has sufficient power, and the life of a wooden boat in this district is so short that there is great need in this system of rivers for a powerful snag boat, so constructed as to last for a period of fifteen or twenty years.

*Money statement.*

July 1, 1902, balance unexpended .....	\$64,014.38
June 30, 1903, amount expended during fiscal year .....	23,234.43
July 1, 1903, balance unexpended .....	40,779.95
July 1, 1903, outstanding liabilities .....	29.25
July 1, 1903, balance available .....	40,750.70
Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903:	
For new steel snag boat.....	\$60,000.00
For maintenance of improvement.....	a 20,500.00
	80,500.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

a Biennial appropriation should be \$41,000.

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## List of appropriations.

By act of—	Yazoo River.	Tallahatchie River.	Big Sunflower River.	Tchula Lake.	Total.
March 3, 1873 .....	\$40,000.00				\$40,000.00
March 3, 1875 .....	12,000.00				12,000.00
August 14, 1876 .....	15,000.00				15,000.00
June 18, 1878 .....	25,000.00				25,000.00
March 3, 1879 .....	15,000.00	\$6,000.00	\$20,000.00		41,000.00
June 14, 1880 .....	12,000.00	9,000.00	8,000.00		29,000.00
March 3, 1881 .....	6,000.00	8,000.00	4,000.00	\$3,000.00	16,000.00
August 2, 1882 .....	8,000.00	8,000.00	5,000.00	2,500.00	18,500.00
July 5, 1884 .....	10,000.00	8,000.00	5,000.00	1,500.00	19,500.00
August 5, 1886 .....	15,000.00	3,500.00	5,000.00	2,000.00	25,500.00
August 11, 1888 .....	32,000.00	5,000.00	5,000.00	3,000.00	45,000.00
September 19, 1890 .....	25,000.00	5,000.00	5,000.00	3,000.00	38,000.00
July 13, 1892 .....	20,000.00	5,000.00	5,000.00	3,000.00	33,000.00
August 18, 1894 .....	20,000.00	4,000.00	5,000.00	3,000.00	32,000.00
June 3, 1896 .....	20,000.00	4,000.00	5,000.00		29,000.00
March 3, 1899 .....	20,000.00	5,000.00	5,000.00		30,000.00
June 13, 1902 (allotments) .....	21,000.00	10,000.00	20,000.00	4,000.00	55,000.00
Total amount appropriated .....	316,000.00	65,500.00	97,000.00	25,000.00	503,500.00
Total amount expended .....	294,164.99	61,418.32	83,321.18	23,815.56	462,720.05
Balance unexpended .....	21,835.01	4,081.68	13,678.82	1,184.44	40,779.95

## COMMERCIAL STATISTICS

### (a) YAZOO RIVER.

Yazoo River was navigable from mouth to head the entire fiscal year.

List of boats engaged in navigation of Yazoo River during the fiscal year ending June 30, 1903.

Name.	Class.	Tonnage.	Length.	Breadth.	Depth.	Draft.		Between—	Round trips.	Passengers.
						Light.	Loaded.			
Alarm <sup>a</sup> .....	Stern-wheel.	189	142	26	4.3	3.5	5.5	New Orleans and Cold-water River.	....	....
C. B. Bryan .....	do ..	96	114	29	4.5	2.5	4	New Orleans and Round-shot.	2	....
H. C. Brockman .....	do ..	75	91	22.6	3.8	2	3	Vicksburg and Big Sunflower River.	8	....
F. Weyerhauser .....	do ..	216	140	31	4.5	2.5	4	do ..	8	....
Warren .....	do ..	144	134	26	4	2	4	Vicksburg and Greenwood	6	161
Jack Osborn .....	do ..	125	120	30	5	1.8	3	Greenwood and Belzona.	48	476
Rees Pritchard .....	do ..	196	150	31	3.3	1.5	4	Vicksburg and Greenwood	43	1,024
Haillette .....	do ..	196	161	30.5	4.5	1.8	5	do ..	29	768
City of Knoxville.	do ..	147	130	18	3	2.5	4	Yazoo City and mouth of Sunflower River.	156	2,400
City of Greenwood.	do ..	97	130	28	3.5	2.5	4.5	Yazoo City and Belzona	156	3,500
Maggie .....	do ..	50	85	19	3.5	2.5	4.5	Vicksburg and Yazoo River points.	10	25
Edna .....	do ..	50	70	21.4	3	2	3	Vicksburg and Steele Bayou.	10	....
Vernie Mac .....	do ..	122	127	24.7	4.9			do ..	10	....
American .....	do ..	190	158	27.6	4.2	2.5	5	Vicksburg and Greenwood	12	390
Wichita .....	do ..	97	130	28	3.5	2	4.5	Vicksburg and Big Sunflower River.	31	1,500
Joe Seay <sup>a</sup> .....	Tug...	27	75	16	6.6	6.5	8	Vicksburg and—		
								Yazoo City .....	2	....
Edna <sup>a</sup> .....	Gasoline.	14	47	11	3.1	.5	4	Satartia .....	3	....
Hazela .....	do ..	14	53	12	2.8	1	1.5	Vicksburg and Holland Landing.	9	....
Cody Hulla .....	do ..	9	65	12.8	2	1.3	2	Belle Yazoo .....	6	....
Pride of Virginia.	do ..	6	30	10	2	1.2	1.8	Vicksburg and Big Sunflower River.	25	20
Queen .....	do ..					1.2		do ..	10	15
								do ..	32	20
								Vicksburg and Anthony Ferry.	121	20

<sup>a</sup> With barges.

*Summary of commerce reported for Yazoo River.*

Articles.	1902-3.	Articles.	1902-3.
	<i>Tons.</i>		<i>Tons.</i>
Cotton .....	10,600	Coal.....	3,000
Cotton seed .....	17,177	Miscellaneous.....	2,073
Hides and skins .....	90		
Live stock .....	1,624	Total freight for Yazoo proper ...	326,383
Lumber .....	10,509	Total freight for tributaries.....	218,120
Staves.....	21,855		
Provisions.....	8,401	Total freight for Yazoo and tributaries.....	544,503
Grain .....	21,104		
Saw logs .....	229,950		

Estimated value, \$6,876,000.

After the new mouth of Yazoo River was opened to navigation, the merchants of Vicksburg purchased the steamer *American*, with a view to reviving the steamboat trade between Vicksburg and the Yazoo River and its tributaries.

## (b) TALLAHATCHIE RIVER.

Tallahatchie River was navigable to Sharkey the entire fiscal year, and to Cold-water River at high stages.

*List of steamboats engaged in navigation of Tallahatchie River during the year.*

Name.	Class.	Tonnage.	Length.	Breadth.	Depth.	Draft.		Between.	Round trips.	Passengers.
						Light.	Loaded.			
Jack Osborn.....	Stern-wheel.	125	<i>Feet.</i> 120	<i>Feet.</i> 30	<i>Feet.</i> 5	<i>Feet.</i> 1.8	<i>Feet.</i> 3	Greenwood and Philipp ..	2	10
Choctaw <sup>a</sup> .....		223	127	24	4	1.5	3.5	Greenwood and Sharkey ..	62	386
Alda.....		73	121	21	4	1.8	3.5	.....do.....	40	372

<sup>a</sup> With barge.

*Summary of commerce reported for Tallahatchie River.*

Articles.	1902-3. <sup>a</sup>	Articles.	1902-3. <sup>a</sup>
	<i>Tons.</i>		<i>Tons.</i>
Cotton .....	1,980	Provisions .....	37
Cotton seed .....	4,125	Grain.....	208
Hides and skins.....	14	Miscellaneous .....	468
Live stock .....	385		
Lumber .....	1,206	Total .....	16,402
Staves.....	7,980		

Estimated value, \$666,000.

<sup>a</sup> Incomplete. Six persons failed to report amount of business for the year. There probably were as many saw logs handled in 1902-3 as were reported for 1901-2 (30,000 tons).

## (c) BIG SUNFLOWER RIVER.

Big Sunflower River was reported to have been navigable for small steamboats for about ten months of the year, or with exception of the months of September and October.



# 1400 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

*List of boats engaged in navigation of Big Sunflower River during the year.*

Name.	Class.	Tonnage.	Length.	Breadth.	Depth.	Draft.		Between.	Round trips.	Passengers.
						Light.	Loaded.			
City of Knoxville...	Stern-wheel.	147	<i>Feet.</i> 130	<i>Feet.</i> 18	<i>Feet.</i> 3	<i>Feet.</i> 2.5	<i>Feet.</i> 4	Yazoo City and Campbellsville.	156	2,000
Wichita	do	97	130	28	3.5	2	4.5	Vicksburg and Faison.	31	1,500
Edna	Gasoline.	14	47	11	3.1	5	4	Vicksburg and Holland Landing.	9	-----
Hazels	do	14	53	12	2.8	1	1.5	Vicksburg and Lake George.	4	5
Cody Hull	do	9	65	12	2	1.3	2	do	10	10
Pride of Virginia	do	6	30	10	2	1.2	1.8	Vicksburg and Murphey Bayou.	32	20

<sup>a</sup> With barges.

*Summary of commerce reported for Big Sunflower River.*

Articles.	1902-3.	Articles.	1902-3.
Cotton .....	<i>Tons.</i> 2,096	Grain .....	<i>Tons.</i> 3,241
Cotton seed .....	8,071	Saw logs .....	165,450
Hides and skins .....	39	Miscellaneous .....	1,237
Live stock .....	1,911		
Lumber .....	3,600	Total .....	186,313
Provisions .....	668		

Estimated value, \$1,068,000.

(d) TCHULA LAKE.

Tchula Lake was navigable from December to April.

*List of boats engaged in navigation of Tchula Lake during the year.*

Name.	Class.	Tonnage.	Length.	Breadth.	Depth.	Draft.		Between.	Round trips.	Passengers.
						Light.	Loaded.			
City of Greenwood...	Stern-wheel.	97	<i>Feet.</i> 130	<i>Feet.</i> 28	<i>Feet.</i> 3.5	<i>Feet.</i> 2.5	<i>Feet.</i> 4.5	Head and foot of lake	15	250
Maggie	do	50	85	19	3.5	2	3.5	do	5	50

*Summary of commerce reported for Tchula Lake.*

Articles.	1902-3.	Articles.	1902-3.
Cotton .....	<i>Tons.</i> 750	Provisions .....	<i>Tons.</i> 10,000
Cotton seed .....	2,750	Grain .....	1,400
Hides and skins .....	10	Miscellaneous .....	200
Live stock .....	45		
Lumber .....	250	Total .....	15,405

Estimated value, \$482,000.

REPORT OF MR. T. C. THOMAS, ASSISTANT ENGINEER.

UNITED STATES ENGINEER OFFICE,  
Vicksburg, Miss., June 30, 1903.

CAPTAIN: I have the honor to submit report on snagging operations and other improvement work on the Yazoo River and its navigable tributaries during the fiscal year ending June 30, 1903.

## (a) YAZOO RIVER.

Snagging began in this river September 15, 1902, when the snagboat *Columbia*, James H. Britton, master, entered it from the Big Sunflower River. The *Columbia* worked upstream from the mouth of Big Sunflower to Welch Camp, reaching the latter point October 1. At the earnest request of the steamboat men, the *Columbia* then returned to the Big Sunflower. The *Columbia* reentered the Yazoo November 13 and reworked the river from mouth of Big Sunflower to Welch Camp; then worked on up the river to Shell Bluff, 2 miles above Sheppardtown and 39 miles below the head of the stream. The total distance worked over was 107 miles, leaving 70 miles of river not covered this field season. The short time devoted to the Yazoo was due to the urgent need of a snagboat on the lower Sunflower, coupled with the fact that the Yazoo was in fair condition from its mouth to the Big Sunflower.

Field work was suspended December 6 on account of the high stage of the river, and the *Columbia* returned to Vicksburg, reaching that place December 12, having been delayed by a short inspection trip in Tchula Lake.

The stage was favorable during the September trip, and especially so from November 13 to 24, and particular attention was paid to removing channel snags. Steamboat men were requested to report all the obstructions that gave them special trouble and a point was made of destroying these thoroughly. On November 24 heavy local rains caused a rapid rise in the river, the stage reaching 9 feet above low water by the end of the month. Channel snags were hidden by the rise and attention was turned to clearing slides, cutting trees on caving banks, and removing stumps. During the season serious obstructions were removed at the following localities: Templeton, Abydos, Holly Bend, O'Neals Creek, Dixie, Melrose, Short Creek, Jonestown, Hillman, Pluto, Morganza, Rosedale, Burtonia, Welch Camp, Elmore, and Eagle Lake. A portion of the wreck of the *Barksdale* was removed and the cabin of the *Emma Francis*, sunk at Sheppardtown August 28, 1902, was taken out. The hull of the *Francis* has been raised by the owners.

The chopping party, under Foreman James H. Bobbs (see report on Tchula Lake), was transferred to the Yazoo River work November 11. Beginning at the foot of Tchula Lake, this party worked down the Yazoo, cutting leaning timber, dynamiting stumps and shore snags, and clearing slides. Work was suspended at mouth of Big Sunflower River December 6, on account of the unfavorable stage of the river.

The following obstructions to navigation were removed:

By the snag boat *Columbia*:

Snags pulled .....	346
Stumps pulled, cut, and destroyed .....	183
Shore snags cut .....	54
Logs removed from channel .....	12
Jam broken up and destroyed .....	1
Leaning trees felled .....	50
Trees girdled .....	23
Wrecks removed (sunken barge at Holly Bend and part of cabin of steamboat <i>Emma Francis</i> , at Sheppardtown) .....	2

## By the chopping party:

Channel snags removed .....	142
Shore snags cut .....	1,423
Stumps cut .....	183
Leaning trees felled .....	1,735
Square yards of willows and brush cut .....	91

The river was inspected in August, 1902, by Assistant Engineer Walter H. Polk, and in October by Capt. Charles L. Potter, Engineer officer in charge, and Assistant Engineer T. C. Thomas.

The general plan of improvement adopted for this river contemplates the removal of wrecks, sunken logs, and snags from the channel; the clearing of slides; the cutting of leaning trees obstructing the waterway; and the felling of timber on caving banks. No work has been undertaken with the view of increasing the depth, except

where the channel has been injured by dispersion. Here inexpensive wing dams have been built, closing side chutes or narrowing the waterway. No work of this kind was done during the past field season; no special difficulty in crossing the bars having been experienced by the *Columbia* or reported by the steamboat men. The water width of the river at mean low stages varies from 400 feet near its junction with Old River to 250 feet at Yazoo City, and 200 feet at Greenwood. The head of navigation is at the junction of the Yalobusha and Tallahatchie rivers—the head of the stream—and 176 miles from the new mouth, at Kleinston, Landing, Miss. Formerly the worst shoal in the river was at its mouth, 4 miles above Kleinston; but it is believed that the diversion channel past Vicksburg, opened during the fiscal year, will give easy access to the river for all boats adapted to the low-water navigation of the stream. The present depth over shoals, in the river proper, at mean low stage is about 3½ feet. The range in water level, mean low to mean high (natural), varies from 40 feet near the mouth to 26 feet at Yazoo City and Fort Loring, the latter point being 7 miles below the head of the river. In the event of general overflow from the Mississippi River the range in water level is about 34 feet at Yazoo City and 37 feet at Fort Loring.

(b) TALLAHATCHIE RIVER.

The snag boat *Thos. B. Florence*, Thacker G. Ledbetter, master, left Vicksburg August 7, 1902, and reached the mouth of the Tallahatchie on the 12th. The stage being too high for effective channel snagging the boat continued upstream, removing such snags as were in sight and doing some shore work, arriving at Sharkey on the 16th. The river had then fallen to a favorable stage and effective channel work began. During the next three months the river was worked over from the mouth to Swan Lake, a distance of 61 miles. The river was worked over in four intermediate stretches, the boat dropping to the lower end of a stretch and working up. Local rains in latter part of November caused a stage too high for effective work, and snagging was discontinued December 8 at Mark Love Landing. The boat was brought to Vicksburg and laid up December 10. During the greater part of October and November the river stage was very low and all snags were in sight, allowing very effective channel work to be done. At higher stages more attention was paid to removing shore snags and stumps, cutting leaning timber, and clearing slides. The *Florence* has a model bow, giving a small displacement forward, and in consequence can not pull a deeply embedded snag. For this reason many channel snags were removed by dynamite, which was also freely used on stumps along the water's edge.

The following obstructions to navigation were removed:

Snags pulled .....	591
Stumps pulled and destroyed.....	522
Shore snags cut .....	1, 840
Logs removed from channel.....	137
Jams broken up and destroyed.....	9
Side jams broken up and destroyed.....	15
Leaning trees felled .....	588
Trees girdled .....	192
Square yards of willows and brush cut.....	3, 275

The river was inspected in August, 1902, from the mouth to Sharkey by Assistant Engineer Walter H. Polk, and between the same points in October by Capt. Charles L. Potter, Engineer officer in charge, and Assistant Engineer T. C. Thomas.

The general plan of improvement adopted for this river is the same as for the Yazoo, as already outlined. No wing dams have been built, although conditions probably could be improved at some of the worst shoals by their construction. Increased depth over some of the shoals has resulted from the removal of logs embedded in the bottom. At Shegoggs bar, where the low-water depth was 16 inches some years ago, a depth of 30 inches has been obtained in this way. The clearing out of leaning timber, shore snags, and stumps has rendered practically the whole low-water width available for navigation except at a few shoals. This low-water width varies from about 200 feet at mouth to 150 feet at Sharkey, the latter width being maintained, as a rule, up to the mouth of the Coldwater. The worst shoals between the mouth and Sharkey are at the mouth of the river, Shegoggs, and Little Bosom; where the present depth at the usual low water is 30 inches. The usual variation between low water and natural high water is about 24 feet; that between low water and high water, due to general overflow from the Mississippi River, as in 1882 and 1897, is about 30 feet.

The Tallahatchie is navigable at high stages from its mouth to its head at the junction of the Coldwater and Little Tallahatchie rivers, a distance of 98 miles. At middle

stages boats ascend the Tallahatchie to Tillatoba, 84 miles above the mouth, and at mean low water stop at Swan Lake bridge, 18 miles below Tillatoba. The Coldwater is navigable at high water from its mouth to Yazoo Pass, a distance of 37 miles, and the Little Tallahatchie for about 20 miles above its mouth. Boats of light draft formerly ascended the Yalobusha, another tributary of the Tallahatchie, as far as Grenada, Miss., a distance of 63 miles, during extreme high water, but owing to the obstructed condition of the stream and the liability to being caught in the river by the rapid subsidence in stage, it has not been navigated for many years.

## (c) BIG SUNFLOWER RIVER.

The snag boat *Columbia*, James H. Britton, master, left Vicksburg, Miss., August 5, 1902, entered mouth of Big Sunflower in the afternoon of same date, and proceeding upstream on a trip of inspection reached Vicks Landing, 130 miles above the mouth, on the 7th. The boat then returned to Lake George, 18 miles above the mouth of the river, and began working upstream, actual snagging commencing August 9 and continuing to August 24, when Hollands Landing, 65 miles from the mouth, was reached. Wing dams were built at Muscle shoals and foot of Cuba Island to get the boat upstream. The stage was quite low, and the lower stretch of river demanding attention the boat turned back, but had to pull over all the shoals, even where the water was concentrated by wing dams. On the down trip channel snags uncovered by the lower stage were removed, and at Alligator Chute, 14 miles above the mouth, the construction of wing dams was resumed and continued to Oliphant bar, 3 miles downstream. Further wing-dam construction was rendered unadvisable for the time being by a 5-foot rise. The boat therefore worked down to mouth of river, removing all obstructions in sight, and was transferred to the Yazoo River work September 15.

The *Columbia* returned to the Big Sunflower October 4 and resumed the construction of wing dams, using a barge and pile driver kindly placed at the Government's disposal by the Yazoo City Transportation Company. From October 4 to November 13 fourteen wing dams were built between Horseshoe Landing and Alligator Chute (2 miles and 14 miles from mouth of river, respectively), and three dikes built in September were strengthened and extended. On the last-named date work in the Sunflower River was suspended, the boat returning to the Yazoo.

The following is a summary of the work performed:

Snags pulled.....	221
Stumps pulled.....	38
Shore snags cut.....	140
Logs removed from channel.....	32
Linear feet of wing dams built.....	2, 745

*Tabulated statement of dikes built.*

Locality.	Number of dikes.	Depth found.	Gain in depth.	Remarks.
		<i>Feet.</i>	<i>Feet.</i>	
Foot of Cuba Island.....	2	2.0	0.9	Gravel and shells; channel contracted to 90 feet.
Choctaw.....	2	2.2	.8	Gravel and shells.
Alligator Chute.....	2	2.0	.2	Gravel bottom; no scour.
Mabin Island.....	1			Closing chute on left.
Foot of Mabin Island.....	1			To remove central mud lump.
Head of Fifteen-Mile Island.....	2	2.5	.5	Sand bottom.
Oliphant bar.....	2	2.0	1.0	Do.
Fairview.....	1			Do.
Kansas Crossing.....	1	2.0	.5	Do.
Muscle Crossing, upper end.....	1			Whitish clay and shells.
Muscle Crossing, lower end.....	1	2.0	1.0	Closing auxiliary channel.
Kearney.....	2			Do.
Redstore.....	1			Whitish clay and shells.
Horseshoe Landing.....	5	1.7	.8	Bottom blue clay and shells; channel contracted to 40 feet.

In several instances scour was assisted by backing the snag boat against the shoal and working the wheel. In the cases where "depth found," etc., is omitted in the above table the dikes were built at stages 2 to 3 feet above low water. Dikes were built in the general case by driving piling at 2-foot centers in two rows 4 feet apart, the space between being filled with brush and wired in place. In a few

instances water-soaked logs taken from the channel were piled in line on the shoals to serve as dikes, and have proved very efficient in causing deposit.

The general plan adopted for the improvement of the Sunflower contemplates the removal of snags, felling of leaning trees, clearing of slides, etc., as for the other streams of the Yazoo system, with special attention to concentration of water on the shoals by spur dikes.

The removal of snags and leaning timber has rendered the whole low-water width available for navigation where the depth is sufficient. The improvement in depth over the shoals is about 0.7 foot. The channel in the Sunflower was formed by overflow water from the Mississippi River and is much too large for the low-water discharge. Since the building of the levees on the Mississippi front the annual scouring out of the Sunflower by water deflected from the Mississippi has ceased, and a progressive fill has resulted in the river bed. The low-water depth on the worst crossings is 1.7 feet, and in the bends it seldom exceeds 2.5 feet. The low-water width is from 250 to 300 feet. The usual variation from mean low-water level to mean high (natural) is 33 feet at mouth of the river and 17 feet at Baird, 140 miles up. The variation in case of general overflow from the Mississippi River is about 40 feet.

The present head of high-water navigation may be placed at Lehrton, 175 miles above the mouth. At medium stages boats ascend to Hollywood, 111 miles up, and at low water stop at Campbellsville, 19 miles from the mouth.

The river was inspected in August, 1902, from the mouth to Vicks Landing by Assistant Engineer T. C. Thomas, and in October from the mouth to Bonney Place by Capt. Charles L. Potter and Assistant Engineer T. C. Thomas.

(d) TCHULA LAKE.

Quarter boat No. 2, James H. Bobbs, foreman in charge, was towed from Vicksburg, Miss., to head of Tchula Lake August 7 to 11, 1902. The boat was dropped down the lake, doing some necessary clearing on the way, and arrived at Marcella Landing, about the halfway point, August 22. The regular work of clearing banks and blowing out logs and stumps from the channel was begun 2 miles above Marcella and carried downstream. The banks were covered with willows from 3 inches to 3 feet in diameter, which were felled for a distance of 50 feet back from the water's edge on both banks, in the general case, and 60 feet back on all sharp points. The lake from Islandside down to Watson was found impassable on account of leaning trees and projecting shore snags. The trees were felled and cut into short lengths and snags were cut off close to the ground surface or blasted. The stretches from Quofoloma to Mount Vernon, Evansville to Upper Bucksport, and Winchester to Tightwad were in very bad condition on account of stumps and partly buried logs in the channel. Caving banks at Stonewall gave rise to mud lumps in the channel, which were removed with dynamite. Seventeen jams of stranded drift logs were removed, the more important being at Lower Marcella, Mount Vernon, and Arcola. The Mount Vernon jam was 200 feet long and solid from bank to bank. The main jam was at Arcola and formed during the high water of 1900-1901. This obstruction filled the whole river bed to the level of the top banks and during the high water of 1901-2 caused the accumulation of a drift raft reaching 2 miles upstream. Navigation through the lower end of the lake was stopped, even at the highest stages, until the planters and steamboatmen directly interested raised a small fund with which the top of the jam was removed, allowing the accumulated drift to pass on and out of the lake. The jam, as found last low-water season, contained over 5,000 logs, all wholly or partly embedded in silt, and solid down to the bottom of the stream. The logs were loosened to successive depths by the free use of dynamite, cut into short lengths and hauled out of the channel with ropes. Eight hundred and fifty pounds of dynamite were expended on this jam alone. The party reached the foot of the lake November 10, 1902, and was transferred to the Yazoo River work. The following obstructions to navigation were removed:

Snags pulled .....	14
Shore snags cut .....	2, 884
Logs removed from channel .....	2, 496
Jams broken up and destroyed .....	17
Side jams broken up and destroyed .....	6
Leaning trees felled .....	30, 456
Leaning tree topped .....	1
Trees girdled .....	11
Square yards of willows and brush cut .....	3, 230

The water fell to a very low stage shortly after beginning operations, and considerable difficulty was experienced in keeping the quarter boat abreast of the work. Black Creek, a tributary of the lake from the hills on the east, causes a small discharge through the lower end of the lake throughout the summer. After passing the mouth of the creek the quarter boat was moved by impounding the discharge with temporary dams. The boat would be floated down the pool thus formed to the dam, which would then be blown up and the boat flushed on downstream until the flood wave was dissipated.

The lake goes dry during the low-water season at points between the head and Sunrise Landing, 9 miles down. From the latter point to Upper Marcella, 26 miles, the water is impounded in a pool of fair width and depth. The lower half of the lake carries the water from Black Creek out to the Yazoo and never goes dry, but the cross section of discharge dwindles to a width of 20 feet in places, and to a ruling depth of 3 to 4 inches.

Before the improvement work of last season boats required a stage of 22 to 23 feet above low water in the Yazoo to pass through the lake, and at all stages from this up to high water they were subject to injury from leaning trees and projecting shore snags. The lake can now be navigated at stages about 8 feet above low water in the Yazoo with a head rise in the latter stream, when a minimum depth of about 3 feet and a least-water width of 120 feet are found.

The variation in level from mean low water to mean high (natural) is about 20 feet, increasing to about 30 feet in case of a general overflow from the Mississippi River. The lake heads in the Yazoo, 30 miles below Greenwood, Miss., and returns to that stream at a point 32 miles above Yazoo City, Miss., and is navigable throughout its entire length of 60 miles, at stages giving ingress to boats at head of lake.

The lake was inspected from mouth of Black Creek to its foot by Capt. Charles L. Potter, Corps of Engineers, and Assistant Engineer T. C. Thomas, in October, 1902. December 9 and 10 the snag boat *Columbia* ran up the lake as far as Dunbarton, 20 miles from the foot, inspecting the stream for jams. The lake was found reasonably free from drift, and the snag boat proceeded to Vicksburg.

Very respectfully, your obedient servant,

T. C. THOMAS, *Assistant Engineer.*

Capt. CHAS. S. BROMWELL,  
*Corps of Engineers.*



## APPENDIX Y.

### IMPROVEMENT OF ARKANSAS RIVER AND OF CERTAIN RIVERS IN ARKANSAS AND MISSOURI.

REPORT OF CAPT. GRAHAM D. FITCH, CORPS OF ENGINEERS, OFFICER  
IN CHARGE, FOR THE FISCAL YEAR ENDING JUNE 30, 1903, WITH  
OTHER DOCUMENTS RELATING TO THE WORKS.

#### IMPROVEMENTS.

- |  |  |
|--|--|
| 1. Arkansas River, Arkansas.           | 6. Current River, Arkansas and Missouri.           |
| 2. White River, Arkansas.              | 7. St. Francis and L'Anguille rivers,<br>Arkansas. |
| 3. Upper White River, Arkansas.        | 8. St. Francis River, Missouri.                    |
| 4. Cache River, Arkansas.              |  |
| 5. Black River, Arkansas and Missouri. |  |

ENGINEER OFFICE, U. S. ARMY,  
*Little Rock, Ark., July 17, 1903.*

GENERAL: I have the honor to forward herewith annual reports for  
the fiscal year 1903 of the following-named works of river and harbor  
improvements under my charge. \* \* \*

Very respectfully, your obedient servant,

GRAHAM D. FITCH,  
*Captain, Corps of Engineers.*

Brig. Gen. G. L. GILLESPIE,  
*Chief of Engineers, U. S. A.*

#### Y 1.

#### IMPROVEMENT OF ARKANSAS RIVER, ARKANSAS.

*Operations this fiscal year.*—The period of actual operations this  
year was comparatively short. Although preparations for active  
operations were begun as soon as possible after the passage of the  
river and harbor bill, the *C. B. Reese* did not get into the field until  
August 21 and the *Arkansas* until ten days later. There was no con-  
tinuous low-water period during the year, and small freshets each  
month caused interruptions in the work. Both boats were compelled  
to cease work the middle of December because of these frequent  
freshets. They resumed work again in May, 1903, the *C. B. Reese* at  
Cockrells on the 22d and the *Arkansas* at Shoal Creek on the 25th. In  
this report the figures shown thus (22), after the name of a locality,  
refer to its distance above the mouth of the river.



*Snagging operations.*—The *C. B. Reese* was lying with the Mississippi River Commission fleet at Memphis at the beginning of the fiscal year, having been there since October 25, 1901, because this appropriation did not have sufficient funds to complete the rebuilding of the boat and bring her home. The boat laid at that fleet until July 21, 1902, when this office placed a small force of mechanics on it. A complete set of bilge siphons was placed, the steam shifting rigging taken down and reassembled with a larger main shaft and a new base block, and the paddle wheel overhauled. Some of the working outfit of the boat was shipped to it from the Little Rock warehouse; the remainder was purchased. That shipped from Little Rock was not in very good condition and needed considerable repair, which was made on the boat. Active field operations began at foot of Caldwell Bend (9) August 21 and were suspended at South Bend December 16. The boat was run to Little Rock and the crew laid off December 22. The boat now laid at Little Rock in the care of watchmen until April 16, 1903, when a partial crew was employed and the annual repairs begun. The arrangement of the rooms on the main deck was changed so as to afford the deck crew sleeping quarters independent of the rigging room. The original arrangement was such that the rigging and the working tools were stored in the same rooms as used for sleeping quarters for the crew. In making this change the engine room was shortened about 8 feet, necessitating the rebuilding of lockers and work and vise benches in that room. The furnace for the main boilers was rebuilt. In one of the boiler feed pumps the valve plate for the discharge valve was taken out and a new plate carrying removable and renewable valve seats was placed in its stead. Also, the plungers for this pump were re-turned in a lathe to remove the inequalities in the surfaces, and a new T-head for the plunger rods was made. The electric-light plant from the old *Beauregard* was installed on this boat. The cabin and sleeping quarters were furnished with screen doors and windows and the boat painted throughout. The boat was placed in commission the second time this year on May 16, and after procuring supplies and fuel left for the lower river May 20. Snagging operations were resumed at Cockrells (106) on May 22, but, on account of a rising river, had to be temporarily suspended on May 26, when the boat was run to Swan Lake (80). It lay there, waiting for the flood to pass out, until June 15, when snagging operations were resumed and continued to the close of the year.

In addition to regular snagging work the *C. B. Reese* towed the hull for the snag boat *Quapaw* from Poverty Point, or Foot of Cut-off (8), to Red Fork (25), and made a run up White River to Devall Bluff on an inspection of that stream.

At the beginning of this fiscal year the snag boat *Arkansas* was lying at Little Rock, where it had been since March 10, 1901, there being no funds to operate the boat during that period. A crew was placed on the boat August 16, 1902, and it was put in condition for active work with as little delay as possible. It left Little Rock (174) August 31 and began snagging operations at Fish Point (103) the next day. These operations were continued until high water caused a suspension of work, December 16. The boat was run to Little Rock and the crew laid off December 22. The boat laid here in care of watchmen until May 1, when preparation for resumption of field work was begun.

A new canvas roof was placed; the condenser coil in the ice plant was taken down and a split in it retinned and soldered and the coil replaced; the ammonia compressor was taken apart, cleaned, boxing rebabbitted, and the machine reassembled; the paddle wheel was overhauled; all rotten or broken arms and circles were replaced with sound pieces; two single-brace journal hangers were placed on the main driving shafts of the capstans, and the cabin and sleeping quarters fitted with screen doors and windows. The boat was placed in commission the second time this season on the 20th of May. It left Little Rock (174) May 23, began work at Shoal Creek (281) May 25, and continued at work until the close of the year. In addition to the regular snagging operations, this boat made two inspection trips—one between Little Rock and Vincennes Bend (59) and the other between Dardanelle (261) and Little Rock—and also towed the hull for the snag boat *Quapaw* from Red Fork (25) to Little Rock (174).

A summary of the work accomplished by the two boats and an exhibit showing the distribution of time for the fiscal year are given in the tables below.

*Summary of work accomplished.*

Date.	Snag boat.	Work done between—	Distance.	Snags removed.	Trees cut.	Drifts broken up.	Miles run.
			<i>Miles.</i>				
1902.							
August	C. B. Reese	Skinnners and Sawyers	24	24			221
September	do	Sawmill Bend and Bickers	56	225	854	5	121
	Arkansas	Fish Point and Ledwidge	97	161	209	5	243
October	C. B. Reese	House Bend and Hanna-berry.	51	143	973		154
	Arkansas	Cockrell and Little Rock	68	259	1,571	1	190
November	C. B. Reese	Poverty Point and Pendleton.	33	87	2,583	1	141
	Arkansas	Robroy and Pine Bluff	9	95	196	3	270
December	C. B. Reese	Poverty Point and Oakley	43	14	2,231		297
	Arkansas	Murdaugh and Simpsons	17	18	1,433		252
1903.							
May	C. B. Reese	Simpsons and Pine Bluff	30	6	19		96
	Arkansas	Vanmeters and Shoal Creek	50		967		191
June	C. B. Reese	Simpsons and Pine Bluff	30	53	762		75
	Arkansas	Little Rock and Piney	101	65	1,267		341
Total for the year.		Skinnners and Shoal Creek	272	1,150	13,015	15	2,592

*Distribution of time of snagboats for the fiscal year.*

	C. B. Reese.	Arkansas.
<i>Days.</i>		
Completing rebuilding of boat	30	
In ordinary	134	177
Annual repair	30	32
In White River	5	
Snagging operations:		
Actual snagging	76	77
Field repairs	18	9
Fueling	9	9
Traveling	17	25
Sundays and holidays	25	20
Temporary suspensions on account of weather or unfavorable stage of water	21	16
	166	156
Total for the year	365	365

*Repair to Red Fork revetment.*—This revetment was broken in several places during the high water of May, 1898. It was partially repaired in fiscal year 1901. Caving of the bank at one of the unrepaired breaks threatened to injure a high-water levee that lies directly along the brink of the bank at this locality. For the purpose of protecting this levee repair to the revetment was begun this fiscal year. Contract was entered into with Hunter & Frey, of Memphis, Tenn., to make the necessary repair, the payment for the work to be based on the quantity of material used, the contract rates being \$10.50 a cord for brush in place in the mattress, and \$5.75 a cubic yard for stone in place in the work. The contractor procured the stone on the Ohio River and barged it, 2,255 cubic yards, to the work. The brush was procured from bars in the lower river not a great way from the work. Actual construction work was begun January 25, 1903. One mattress, 100 feet wide by 556 feet long, was sunk into place February 8, 1903, since which time the river has been at too high a stage for resumption of work. In addition to placing the mattress, upon which 430 cubic yards of stone were used, 228 cubic yards of stone were placed in making repair to 300 linear feet of upper bank protection upstream from the break in the revetment. The contractors retained their working force until March 7, when it became apparent that work could not be resumed for some time. The unused stone was stored on the bank and the crew discharged, two quarterboats, two brush barges, and a weaving barge being retained at the site of the work for use in completing the repair. During the high-water period just passed there has been considerable caving in Red Fork Bend, and the indications are that 1,250 linear feet of the lower end of Red Fork revetment has been seriously injured if not practically destroyed. \* \* \*

*United States Warehouse, Little Rock.*—As this appropriation now owns only two snag boats, there is no further use for a warehouse at Little Rock, so the one there was torn down and it, together with the property that was stored therein, was taken to Batesville on the hull of the old *Beauregard* by the snag boat *Quapaw* when that boat was sent to her field of work.

*Hydraulic dredge.*—The river and harbor act of June 13, 1902, appropriated \$110,000 for continuing the improvement of the Arkansas River, and authorized the expenditure of so much thereof in the discretion of the Secretary of War as might be necessary in procuring a suitable dredge boat or boats. After making provision for maintaining and operating the snag boats, \$70,000 remained available for dredges until a caving bank near the Red Fork levee endangered the levee, when \$20,470 of the \$70,000 was diverted to the repair of the revetment, leaving \$49,530 which, being insufficient to procure a suitable dredge, is still available.

The attempts to make and maintain navigable channels in this river by means of permanent works having failed to give the desired results, resort must be had to temporary expedients. Of these hydraulic dredging, which has been successful on the Mississippi River, seems to offer the best inducements; although to maintain a navigable channel at all times in the Arkansas River by this method will be quite an undertaking.

Any improvement to be of material benefit to the Arkansas River Valley and the community at large should extend from the mouth to Little Rock, 173 miles. Omitting that portion of the Arkansas River lying between its junction with White River and the Mississippi River, there are fifty-eight shoals that obstruct navigation to Little Rock. The bed of the river consists of shifting sand, making the channel one of uncertain position. The volume of flow of the stream varies from approximately 600,000 cubic feet a second at maximum flood stage to 1,160 cubic feet a second at minimum low water, the ordinary low water flow being 2,700 cubic feet a second at Little Rock. Below Little Rock the low-water flow increases until at the junction with White River (foot of cut-off) the minimum flow is 1,850 cubic feet a second and the ordinary low-water flow is about 3,000 cubic feet a second. The flow of the river when at bank-full stage at Little Rock (23 feet on Weather Bureau gauge) is 190,000 to 200,000 cubic feet a second, seventy times the ordinary low-water flow. This shows the extent of the destructive influences that annually destroy any low-water channels that may be developed during the preceding low-water season.

The channel depths are not great, and generally during ordinary low water are too small to afford profitable navigation. It is an exception for the river to be navigable all the year out of either Pine Bluff or Little Rock. During the last nine years such navigation was possible out of Little Rock during one year only and out of Pine Bluff during two years only, while in two years of the nine navigation was suspended over the entire river, once for a period of nineteen days and once for a period of fifty-three days. Gauge heights and discharge observations do not indicate channel depths. Every rise builds up the crossings, making sand dams through which the falling river cuts a channel. A peculiarity of the Arkansas River is the slight difference in depths on the many shoals and the absence of gradual shoaling of the river from Little Rock down. The whole river gets shoal at the same time excepting when the lower reaches are under the influence of backwater from the Mississippi River. Two and five-tenths feet on the Weather Bureau gauge at Little Rock is ordinary low stage. It is seldom that navigation continues until the river falls to that stage. When Cumbeysville gauge on the Mississippi River is below 6 and the Arkansas River at or below ordinary low stage, either in gauge height or volume of flow, few, if any, of the shoals above the foot of the cut-off will have a greater depth than 2 feet on them, the majority of them having only 18 to 20 inches. Under ordinary conditions steamboatmen expect to find on a falling river only about 4 feet in the channel from Little Rock to Arkansas Post, when the Little Rock gauge is at 7 feet and Cumbeysville gauge is at 22 feet. With the Arkansas River remaining stationary and the Mississippi River falling, this depth of only 4 feet will be continued to the head of cut-off when Cumbeysville gauge shows 18 feet. When the Little Rock gauge is at  $3\frac{1}{2}$  feet, 2-foot depths may be expected from Little Rock downstream until the influence of backwater from the Mississippi River is felt. Of course these relations between gauge heights and channel depths do not hold good at all times, but they do represent the natural conditions as averaged by the river men, the experience of the Government boats.

showing them to be fairly correct. Below is given a table showing the average number of days a year during the last ten years that channel depths were 4 feet or less and 2 feet or less:

Section of river.		Number of shoals.	Average distance apart.	Days per year when navigable depths are—					
Location of section.	Length.			4 feet or less.			2 feet or less.		
				Maxi- mum.	Mini- mum.	Aver- age.	Maxi- mum.	Mini- mum.	Aver- age.
Mouth to Caldwell's Bend	<i>Miles.</i> 9	2	<i>Miles.</i> 4.5	0	0	0	0	0	0
Caldwell's Bend to Red Fork	16	7	2.3	85	0	54	87	0	35
Red Fork to Arkansas Post	10	3	3.3	85	24	60	90	0	54
Arkansas Post to South Bend	17	4	4.2	116	36	80	112	0	54
South Bend to Swan Lake	28	8	3.5	230	75	194	112	0	54
Swan Lake to Little Rock	94	36	2.6	279	143	203	177	15	72
Mouth to Little Rock	174	60	2.9						

In the annual collection of commercial statistics effort has been made to get reports of periods of no navigation. From these it can be shown that navigation out of Little Rock during the last nine years has been suspended on an average of 92 days a year, the minimum number of days being 0 in fiscal year 1899, the maximum being 230 in fiscal year 1902, and the total for the nine-year period being 825. Out of Pine Bluff during the same period the total number of days of no navigation was 525, the minimum number being 0 in fiscal years 1899 and 1901, the maximum number being 137 in fiscal year 1902, and the average for the period being 58. The boats running out of Little Rock have not been of as light draft as those running out of Pine Bluff. This in a measure accounts for the shorter periods shown for Pine Bluff. One of the boats running into Pine Bluff, the *J. N. Harbin*, can carry 300 bales of cotton on 22 inches draft, therefore frequently does business in and out of that port when there is slightly less than 2 feet in the river.

The average fall of the Arkansas River from Little Rock to the Mississippi River is 0.67 foot per mile. No extensive surveys have been undertaken to determine exact slopes in the pools and over the shoals in low water, but there is good reason to believe that the pool slopes are about 0.25 foot to 0.33 foot per mile, and that the slopes over the shoals will in some instances be as steep as 2 feet per mile, the slopes over the majority of them, however, being less than 1½ feet per mile. Dredge cuts when fully opened would tend to reduce the slopes on the shoals and increase those in the pools, but in estimating the probable channels that can be obtained it is safer to adopt the slopes that nature gives. It has already been stated that the minimum low-water flow to be dealt with is 1,160 cubic feet a second. A channel having a surface width of 150 feet, a bottom width of 80 feet, and a depth of 4 feet would carry this volume, but the mean velocity, 2.4 feet a second, would be destructive. If a mean velocity of 1.5 feet a second be taken as the maximum that can be permitted, the depth of channel will have to be reduced to 2½ or 2¾ feet, the surface width increased to 450 feet, and the bottom width to 100 feet. These are the greatest depths that can be expected during lowest stages.

During ordinary low water, when the flow is 2,700 cubic feet a second, the slopes over the shoals will be a little flatter than at the lower stages, and on account of the larger channel that can be obtained the mean velocity can be a little greater. If 2 feet a second be taken as the limiting velocity and the slope be taken at 1.5 feet a mile, calculation indicates that the procurable channel will have a surface width of 525 feet, a bottom width of 175 feet, and a depth of  $3\frac{3}{4}$  to 4 feet. Within the last ten years the stage of river has been below ordinary low, during which time these depths could not be maintained for 264 days, the greatest period being 109 days in calendar year 1901, the minimum periods being 0 days in 1893, 1895, 1896, and 1898, the average per year being 26 days. The probable channel that can be obtained during lowest waters is so small that it might of necessity be too crooked to be of any practicable benefit, even if it could be maintained, therefore it seems proper to assume that no beneficial channel can be obtained and maintained during the entire year. It may be possible that the assumed limit of 2 feet a second is a little too high for the assumed ordinary low-water channel; if so the depths will have to be reduced. However, calculation seems to indicate that the ordinary flow of the Arkansas River is sufficient to afford a 4-foot channel from the mouth to Little Rock during 340 days a year as an average, with the probability of the 4-foot channel being maintained all the year during four years in ten, and a probability that it will be maintained only 260 days during one year in ten.

As to the type of dredge required, I conclude from a study of the subject and from a recent examination I made of the dredging fleet of the Mississippi River Commission that for the Arkansas River a dredge should fulfill the following conditions:

It should be a self-propelling, steel-hulled, hydraulic dredge, with side wheels, capable of dredging to a depth of 12 feet and having a capacity of 800 cubic yards of sand per hour; draft, fully equipped, approximately, 3 feet 3 inches; length, 160 feet; width, 40 feet; depth, 64 feet, having one double-suction dredging pump, with discharge pipe 24 inches in diameter; the pump to have one inclosed five-bladed runner and a rectangular casing with renewable casing liners of steel and to be direct connected to a pair of horizontal, tandem, compound condensing engines; the steam plant to consist of six four-flued boilers of the Mississippi River type set in two batteries, to have two suction heads, with flaring mouthpieces suspended in a suction well by means of two A frames connected at their heads; the sand agitator to be of the water-jet type; the discharge pipe to have at the stern a swivel elbow, so that the pipe line can be deflected and the spoil deposited to one side; the pontoons to be keel boats with rudders and arranged to swing under the pipes with the current; the pipe line to be 150 feet long, with its rigid sections joined together by universal couplings; the baffle plate to be movable so as to assist in deflecting the pipe lines; the dredge to be equipped with propelling engines of the Mississippi type, electric-light plant, and refrigerating plant, and be provided with cabin accommodations for the crew.

In most features the dredge would be similar to the *Kappa* and the *Flad*, though with lighter machinery in order to reduce the draft. It should, however, in my opinion, differ from the *Kappa* and the *Flad* in the following particulars:

First. To permit of either upstream or downstream dredging the suction should be reversible, as on the *Delta*.

Second. The jet agitator should be supplied with water by a pump of the centrifugal type, as on the *Zeta* and *Epsilon*, but with a 10-inch discharge.

Third. Instead of raising the spud anchor with a steam cylinder a cable should be used, worked by a double-cylinder vertical engine, as on the *Zeta* and *Epsilon*. These two dredges, however, each have separate engines for raising the spud anchor and the suction heads. This is not considered necessary, and one engine with two drums should be used to raise both the suction heads and the spud anchors.

Fourth. The two suctions should be latticed together.

Fifth. The hull should be stiffened with hog chains.

Such a dredge is estimated to cost about \$110,000.

At least six dredges would be required. Between Little Rock and Swan Lake are 36 shoals, the average length of which at ordinary low water is approximately 1,400 feet, making  $9\frac{1}{4}$  miles of shoals that have a depth of less than 4 feet two hundred and three days during the year. If the time for opening each shoal be estimated at two days, seventy-two days of actual dredging time would be necessary to open a channel in this  $9\frac{1}{4}$  miles of river. If this is to be opened in two weeks' actual time, five dredges of 800 cubic yards nominal capacity would be required. Between Swan Lake and Arkansas Post are 12 shoals, the aggregate length of which is approximately  $2\frac{1}{4}$  miles. Eight of these shoals show less than 4 feet one hundred and ninety-four days a year, and would require dredging at the same time as those lying above Swan Lake. Since the river in this 45-mile section is generally narrower than above, one dredge could probably open within two weeks the 4 shoals that have less than 4 feet for eighty days in addition to the first-mentioned 8. From Arkansas Post to Caldwells Bend there are 10 shoals, but they are comparatively short, aggregating only about three-fourths mile in length, and have less than 4 feet for only sixty days a year. The river in this section is narrow, the bends short, and the direction of flow at high water does not vary much from that at low water; therefore, it is likely that dredge cuts would remain open during one low-water season. It is possible that some of the shoals in the Swan Lake-Arkansas Post section would remain open for a season; therefore, it will be assumed that one dredge can open and maintain a 4-foot channel during ordinary low water from the mouth of the river to Swan Lake. This one with the five required between Swan Lake and Little Rock makes six required for the river. It would be necessary to keep these in commission practically all the time, and the annual operation expenses would be \$150,000. The first cost of the dredges, together with supply steamer, fuel boats, etc., would be \$635,000, if all the dredges be contracted for at one time with one firm. This is a large amount of money to invest in permanent plant to use in experimental work. The Mississippi River from Cairo to Peters has a minimum low-water flow of 71,000 to 79,000 cubic feet a second, an ordinary low-water flow of 100,000 cubic feet a second, and natural depths seldom as small as 5 feet. The adopted channel to be maintained is 9 feet deep. During the fiscal year ending June 30, 1902, eighteen localities required dredging, fully employing the services of six dredges. Remembering that the ordinary low-water flow of the Arkansas River is only 2,700 cubic feet a second, and that it frequently falls below this, and occasionally becomes as small as 1,200 cubic feet a second; that the ordinary low-water depths are about 2

feet, and in many instances only 18 inches, it might appear by comparison with Mississippi River flow and depths that the estimate of six dredges required to maintain a 4-foot channel through the 58 shoals in the Arkansas River is too small. Taking into consideration the large first cost of a dredge fleet, it would appear better for this appropriation to borrow a dredge from some other one and try it a season to see what results can be obtained and just how much territory one dredge can take care of. The balance remaining on hand from the dredge allotment is sufficient to meet the expenses of such an experimental run; therefore, in the estimate for the fiscal year ending June 30, 1905, snagging operations only are provided for.

*Recommendations for future operations.*—The available funds are sufficient to operate the *C. B. Reese* until August 15, 1903, and the *Arkansas* until December 1, 1903, when operations will have to cease. The balance that will then be available will be sufficient, barring accidents, to care for the boats until June 30, 1904, but no longer, the estimated balance available for that date being \$125. Nine months' operations by the *Arkansas* and five months by the *C. B. Reese* are none too much to apply to the river each year. The actual working expenses of the boats for that period of time will be \$28,000, to which should be added at least \$7,000 for annual repair and care of boats during winter, making \$35,000 required annually for snagging alone. The estimate for the amount required annually for dredging is withheld until the experimental dredging can be done, thus making the estimated amount that can be profitably expended during the fiscal year ending June 30, 1905, cover snagging operations only.

#### *Money statement.*

July 1, 1902, balance unexpended .....	\$111,698.26
June 30, 1903, amount expended during fiscal year .....	\$34,168.87
Less sales .....	994.76
	<hr/> 33,174.11
July 1, 1903, balance unexpended .....	78,524.15
July 1, 1903, outstanding liabilities .....	3,307.87
	<hr/> 75,216.28
July 1, 1903, balance available .....	<hr/> 10,833.52
July 1, 1903, amount covered by uncompleted contracts .....	
<hr/>	
{ Amount that can be profitably expended in fiscal year ending June 30, 1905, for maintenance of improvement, in addition to the balance unexpended July 1, 1903 .....	
{ Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	
	35,000.00

#### APPROPRIATIONS.

July 3, 1832: For improving the navigation of the Arkansas River, Arkansas, Indian Territory, and Kansas (less \$38 carried to surplus fund) .....	\$14,962.00
March 3, 1835: For improving the navigation of the Arkansas River .....	40,000.00
March 3, 1837: For continuing the works .....	25,000.00
July 7, 1838: For the improvement of the Arkansas River (less \$1,155.66 carried to the surplus fund) .....	38,884.34
From appropriations 1842-1844 (estimate) .....	80,000.00
August 30, 1852: For the improvement of the Arkansas River (less \$269.47 carried to surplus fund) .....	39,730.53
From appropriations 1866-1878 (disbursements reported by Colonel Suter) .....	344,831.59



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April 14, 1876: For removing the bar at Fort Smith, Ark .....	\$10,000.00
June 18, 1878: For removing the bar in the Arkansas River at Fort Smith .....	10,000.00
March 3, 1879:	
For improvement of Arkansas River between Fort Smith, Ark., and Wichita, Kans .....	20,000.00
For removing snags, sand bars, wrecks, and other obstructions, and correcting and deepening the channel * * * on the Arkansas River .....	30,000.00
June 14, 1880:	
For improvement of Arkansas River between Fort Smith, Ark., and Wichita, Kans .....	15,000.00
For improving Arkansas River at Pine Bluff .....	25,000.00
For removing snags, wrecks, and other obstructions * * * on the Arkansas River .....	35,000.00
March 3, 1881:	
For improving Arkansas River between Fort Smith, Ark., and Wichita, Kans .....	24,000.00
For improving Arkansas River at Pine Bluff .....	23,000.00
For improving the Arkansas River .....	25,000.00
August 2, 1882:	
Continuing improvement between Fort Smith, Ark., and Wichita, Kans .....	20,000.00
Continuing improvement at Pine Bluff, Ark. ....	20,000.00
Continuing removal of snags, wrecks, * * * from the Arkansas River .....	35,000.00
July 5, 1884:	
For survey of the Arkansas River from Little Rock to the mouth. ....	19,000.00
Improving Arkansas River at Pine Bluff, Ark. ....	55,500.00
For removing obstructions in Arkansas River from its mouth to Wichita, Kans .....	36,000.00
For the protection of the harbor at Fort Smith, Ark. ....	5,000.00
August 5, 1886:	
Continuing improvement, according to plan and recommendation in Appendix V 13, Executive Document No. 1, Forty-ninth Congress .....	75,000.00
For the removal of snags, wrecks, and other obstructions .....	19,875.00
August 11, 1888:	
Continuing improvement * * * between Wichita, Kans., and the navigable mouth of the Arkansas River .....	150,000.00
For removing obstructions .....	25,000.00
September 19, 1890:	
Continuing improvement from Wichita, Kans. ....	180,000.00
For operating snag boats and removing obstructions .....	20,000.00
July 13, 1892:	
Improving Arkansas River, Arkansas and Indian Territory .....	250,000.00
Removing obstructions and operating snag boats .....	20,000.00
August 18, 1894:	
Continuing improvement (\$10,000 may be used in removing obstructions and operating snag boats) .....	250,000.00
Removing obstructions and operating snag boats .....	20,000.00
June 3, 1896:	
Continuing improvement (\$15,000 may be used in removing obstructions and operating snag boats) .....	100,000.00
Removing obstructions and operating snag boats .....	20,000.00
March 3, 1899:	
Continuing improvement (\$50,000 may be used in removing snags, sand bars, and other obstructions) .....	100,000.00
Removing obstructions and operating snag boats .....	20,000.00
June 13, 1902: Continuing improvement and for maintenance, including the general improvement and removing obstructions and operating snag boats .....	110,000.00
Total appropriations .....	2,350,783.46
September 15, 1900: Allotted from emergency river and harbor act .....	
June 6, 1900, for repairs to Red Fork revetment .....	10,000.00
Total appropriations and allotments .....	2,360,783.46

# APPENDIX Y—REPORT OF CAPTAIN FITCH.

1417

## EXPENDITURES.

For removing obstructions and operating snag boats .....	\$1, 056, 654. 13
For original construction of works for permanent improvement, including survey of river from Little Rock to the mouth .....	903, 311. 93
For maintenance of works for permanent improvement .....	322, 293. 25
Total expended to June 30, 1903.....	\$2, 282, 259. 31
Unexpended July 1, 1903.....	78, 524. 15
	<u>2, 360, 783. 46</u>

## CONTRACT IN FORCE (EMERGENCY).

Name and address of contractor: Hunter & Frey, Memphis, Tenn.

Nature of contract: Repairs to Red Fork revetment.

Rate:

Stone, per cubic yard, \$5.75 in place.

Brush, per cord, \$10.50 in place.

Contract approved December 8, 1902.

Work began January 25, 1903.

Expiration of contract, April 22, 1903.

Extension, reasonable time.

## COMMERCIAL STATISTICS.

No report was received of any commerce above Webbers Falls, Ind. T., nor between Fort Smith, Ark., and Roseville, Ark., 59 miles below. Steamboats made reports that navigation was suspended out of Fort Smith from October 17 to November 11; out of Little Rock from August 23 to 30, from September 22 to 27, and from October 23 to November 16, and out of Pine Bluff from November 1 to 14. Upper Reydells, 57 miles above the mouth, was the head of navigation during period of lowest water this fiscal year.

*List of vessels that navigated Arkansas River from May 31, 1902, to June 1, 1903.*

Name.	Net tonnage.	Draft, loaded.		Between—	R d ips.	Passen- gers.
		Steamer.	Barges.			
		<i>Ft. in.</i>	<i>Ft. in.</i>			
Myrtle Corey .....	9	2 0	3 0	Little Rock and Keiser Quarry .....	52	.....
				Little Rock and Fourche La Fave .....	4	.....
				.....do.....	4	.....
Nettle .....	64	2 0	3 0	Little Rock and Keiser Quarry .....	30	.....
				Little Rock and Browns Landing .....	6	.....
Josie .....	234	4 0	5 0	Mississippi River and logging camps .....	4	.....
Quickstep .....	66	3 0	3 0	Mississippi River and Garland Lake .....	20	100
J. C. Atlee .....	88	3 6	6 0	Mississippi River and Red Fork .....	1	.....
				Little Rock and Pine Bluff .....	25	.....
				Little Rock and Dardanelle .....	12	.....
				Little Rock and Fletchers .....	8	465
Dardanelle .....	164	3 6	3 0	Little Rock and Union City .....	5	.....
				Little Rock and Lasters .....	23	.....
				Little Rock and Roseville .....	3	.....
				Excursion trip .....	44	1, 100
Chicago .....	33	1 8	.....	Mississippi River and Red Fork .....	6	.....
Lucille Nowland .....	298	5 0	.....	Memphis and Pine Bluff .....	35	2, 082
				.....do.....	15	.....
J. N. Harbin .....	266	3 0	.....	Memphis and Corrine .....	1	806
				Memphis and Upper Reydell .....	1	.....
A. D. Allen .....	67	4 0	.....	Little Rock and Pine Bluff .....	25	1, 403
Myrtle B. ....	47	2 0	.....	Little Rock and Shoal Creek .....	3	.....
				Fort Smith and Webbers Falls and intermediate points .....	38	.....
Elva .....	58	2 6	3 0	Dardanelle and Shoal Creek .....	1	.....
				Dardanelle and Petit Jean River .....	5	.....

## 1418 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

*Classification of commerce reported year ending May 31, 1903.*

Articles.	Tons.	Articles.	Tons.
Cotton .....	3,822	Grain .....	486
Cotton seed .....	16,139	Saw logs .....	26,950
Hides and skins .....	4	Square timber .....	300
Live stock .....	380	Miscellaneous freights .....	17,962
Lumber .....	2,479		
Staves and bolts .....	14,058	Total freights .....	86,068
Provisions .....	3,488		

Estimated value, \$2,389,020.

## Y 2.

## IMPROVEMENT OF WHITE RIVER, ARKANSAS.

*Operations this fiscal year.*—Emergency contract for a wooden hull to be used with the machinery of the old snag boat *Beauregard* was entered into with Ed. J. Howard, Jeffersonville, Ind., July 23, 1902. The amount of the contract was \$5,810, which included the delivery of the hull at Memphis, Tenn. The hull, as built, is 128 feet long, 31 feet 8 inches wide, and 4 feet 7 inches deep at side in lowest part. It was launched October 25 and delivered at Memphis, Tenn., November 10. Here it was loaded with 150 tons of coal for the Arkansas River snag boats and towed to that river by the hired steamer *Joy Patton*. The *Patton* delivered the hull to the snag boat *C. B. Reese* at Poverty Point. The *Reese* stored a portion of the coal on the bank near there and some on the bank near Red Fork, where the hull was delivered to the snag boat *Arkansas*. The latter-named boat towed it to Little Rock, arriving there November 22. At that place the machinery and the cabin from the old *Beauregard* was transferred to it. The boat thus built is named the *Quapaw*, and the cost of building it was borne by the appropriations for improving Black, Current, and White rivers. This work was practically completed and the trial trip made March 28. The boat left Little Rock for her field of work April 18, having in tow the hull of the old *Beauregard*, loaded with the property that was stored in the Little Rock warehouse and the lumber and other material saved from that building when it was torn down. The old hull was delivered to the upper White River work at Lock No. 1 April 26. The *Quapaw* then began snagging operations April 29. After cleaning the river between locks numbered 1 and 2, upper White River, and the new channel caused by the failure of the abutment at Dam No. 1, the boat began working between Batesville and Newport May 7, and although the Batesville gauge indicated 5 feet above low water, it was three days pulling over Fatty Bread shoal, three-fourths of a mile below Lock No. 1. This abnormal condition of the channel was due to the general change in the conditions that have existed since the flanking of the abutment to the dam at that lock. Three days after the boat got over Fatty Bread shoal it was compelled to leave this section of the river because of high water. It ran down to Grand Glaize, 16 miles below Newport, and began working in that vicinity, but the high water stopped work there on the 21st of May. The boat ran to Newport, where she lay until the end of the month, when she was transferred to Black River. The results of

the snagging operations are 77 snags pulled and 255 trees cut above Jacksonport, 4 snags pulled, 1 drift broken up, and 79 trees cut in the vicinity of Grand Glaize.

The *C. B. Reese* was used on an inspection trip up to De Valls Bluff in December. On her way back to the Arkansas River she removed 9 snags from the channel between Clarendon and De Valls Bluff.

*Estimates for future operations.*—The *C. B. Reese* will enter this river August 15, 1903, and be operated in it until December 1, 1903. The *Quapaw* will also be in this river during the month of October, 1903. These operations will practically exhaust all the available funds, the amount estimated as available December 1, 1903, being only \$2,300, the greater portion of which will be needed to care for these boats until other funds are made available. To continue the snagging operations and maintain and care for the boats \$22,000 will be required during the fiscal year ending June 30, 1905. This is in addition to the amount available June 30, 1903.

#### *Money statement.*

July 1, 1902, balance unexpended.....	\$22,912.30
June 30, 1903, amount expended during fiscal year .....	10,846.27
July 1, 1903, balance unexpended .....	12,066.03
July 1, 1903, outstanding liabilities.....	176.87
July 1, 1903, balance available .....	11,889.16
<div style="display: flex; align-items: center;"> <div style="font-size: 3em; margin-right: 10px;">{</div> <div> <p>Amount that can be profitably expended in fiscal year ending June 30, 1905, for maintenance of improvement, in addition to the balance unexpended July 1, 1903 .....</p> <p>Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.</p> </div> <div style="margin-left: 20px; text-align: right;">22,000.00</div> </div>	

#### APPROPRIATIONS.

Appropriations for this river have been partly for limited reaches, partly for the whole river, and partly for this river in combination with others.

The appropriations for this river separately and for reaches of it are as follows:

June 23, 1874 .....	\$50,000.00	September 19, 1890 .....	\$30,000.00
August 14, 1876 .....	10,000.00	July 13, 1892 .....	75,000.00
March 3, 1879 .....	10,000.00	August 18, 1894 .....	52,000.00
June 14, 1880 .....	20,000.00	June 3, 1896 .....	22,000.00
June 14, 1880 .....	5,000.00	March 3, 1899 .....	14,815.00
March 3, 1881 .....	8,000.00	June 13, 1902 .....	22,000.00
August 2, 1882 .....	6,000.00		
August 2, 1882 .....	4,000.00	Total .....	406,815.00
July 5, 1884 .....	35,000.00	Expended to June 30, 1903..	394,748.97
August 5, 1886 .....	18,000.00		
August 11, 1888 .....	25,000.00	Balance July 1, 1903..	12,066.03

#### CONTRACT (EMERGENCY).

Name and address of contractor: Ed. J. Howard, Jeffersonville, Ind.

Nature of contract: New hull for snag boat *Beauregard*.

Rate: \$5,810.

Contract approved: July 23, 1902.

Work began: July 28, 1902.

Expiration of contract: November 10, 1902.

# 1420 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

## COMMERCIAL STATISTICS.

The river below Jacksonport was navigable all the year for boats of not more than 24-foot draft. Between Jacksonport and Batesville the river was not navigable during the low-water season, which began early in July and ended about the middle of November. The high-water season began in December and continued until June. This long period of high water is the cause of the reduced tonnage reported by the timber industries, as the water in the river bottomg prevented them obtaining the timber. The packet lines were reorganized during the year, the new arrangement being a weekly packet between Rosedale and Clarendon; one between Judsonia and Augusta; one between Jacksonport and Augusta, and one between Newport and Clarendon.

*List of boats that navigated White River, Arkansas, between May 31, 1902, and June 1, 1903.*

Name.	Net tonnage.	Draft, loaded.		Between—	Round trips.	Passengers.
		Steamer.	Barges.			
		<i>ft. in.</i>	<i>ft. in.</i>			
City of Peoria .....	128	3 6	4 0	Clarendon and Memphis .....	20	.....
Josie .....	234	4 0	5 0	Mississippi River and Logging Camp .....	3	.....
City of Idaho .....	66	3 0	4 0	Newport and Clarendon .....	20	.....
Monarch .....	43	3 6	4 0	do. ....	20	.....
A. R. Bragg .....	162	3 0	5 0	Jacksonport and Augusta .....	50	50
F. W. Tucker .....	99	5 0	5 0	do. ....	15	15
Mary F. Carter .....	50	2 6	3 6	Clarendon and Little Red River .....	4	.....
J. B. Galloway .....	36	3 0	5 0	Clarendon and St. Charles .....	14	12
Geo. Pope .....	62	3 0	4 0	Crocketts Bluff and Rosedale .....	2	.....
Currentview .....	33	1 4	3 0	Augusta and Clarendon .....	40	.....
Gen. Joe Wheeler .....	65	2 6	1 8	Augusta and Little Red River .....	26	.....
Hosmer .....	52	3 6	6 0	Newport and Bains Mill .....	6	.....
Russell Lord .....	186	5 0	6 0	Newport and Augusta .....	2	6
Susan .....	178	4 0	4 6	Newport and McBees .....	2	.....
Jack Rabbit .....	72	2 0	.....	Mouth of White River and Little Red River .....	15	.....
Quickstep .....	66	2 6	5 0	Mouth of White River and Devall Bluff .....	3	.....
Harry Waltz .....	63	1 8	4 0	Rosedale and Little Red River .....	30	.....
Kennedy .....	126	3 0	3 0	Devall Bluff and Cache River .....	3	.....
Buck Elk .....	58	2 6	1 2	Rosedale and Clarendon .....	30	135
Greyhound .....	9	5 6	6 6	Newport and McDougal Landing .....	3	5
				Newport and Black River points .....	5	19
				Newport and Pocahontas .....	18	25
				Mississippi River and Batesville .....	1	.....
				do. ....	1	.....
				Mississippi River and Bayou LaGrue .....	3	.....
				Mississippi River and Cut-off .....	4	.....

*Classification of commerce reported year ending May 31, 1903.*

Articles.	Tons.	Articles.	Tons.
Cotton .....	1,082	Square timber .....	455
Cotton seed .....	7,604	Saw logs .....	56,022
Lumber .....	8,434	Railroad ties .....	50,646
Staves and bolts .....	3,800	Cedar .....	400
Provisions .....	1,213	Miscellaneous freights .....	491
Mussel shells .....	3,716		
Piling .....	6,150	Total tonnage reported .....	140,013

Estimated value, \$682,225.

## Y 3.

### IMPROVEMENT OF UPPER WHITE RIVER, ARKANSAS.

*Operations this fiscal year.*—At Lock and Dam No. 1 the land and guide cribs, the lock house, a frame warehouse, and the dam were built. At Lock and Dam No. 2 the upper guide and the upper land cribs

were nearly completed, the lower land crib was built up to pool level, the lock gates and gear for same were placed, revetment below the lock built, and the paving of the bank slope behind the land wall of the lock about three-fourths completed. All floating plant was repaired excepting the quarter boat *Albany*, which, having become unserviceable, was beached on a bar below Lock No. 2. The dipper dredge was thoroughly overhauled and a new hull built for the towboat *Cleveland*. The upper works and machinery from the old hull have been transferred to the new one and the rebuilding of the boat is nearly finished.

The first lockage was made at Lock No. 1, October 16, but the lock did not remain in service long, for on the night of November 25 the abutment was destroyed. This abutment, which was begun in August, 1900, and completed in February, 1901, was built with its top only 2 feet above the crest of the dam and with its land arm, which was 128 feet long, entering the bank only 8 feet at the level of its top. As at the epoch of submergence of the abutment there would be a difference of level between the two pools of 12.7 feet, it is presumed that the design was adopted for reasons of economy solely. On November 19 the pool rose above the top of the abutment, making it, in effect, simply a portion of the dam. The grouted riprap below the stem of the abutment was soon attacked, and, on November 25, in spite of every effort to save it, the abutment was destroyed by the river eroding below it and then overturning it, making a cut through which the entire flow of the river passed when at medium or low stages. No particular damage was done the dam in general, and to protect the exposed end a heavy layer of derrick stone was placed there. As the natural width of the river at normal pool level at the site of the dam is 500 feet, and the original length of the dam only 324 feet, a longer spillway was desired; therefore no effort was made to close the cut or prevent its widening. This cut has now widened sufficiently to permit building 344 feet additional length to the dam, and the new abutment has been located and construction begun. The original dam has a stepped face; this is to be converted into a slope to comply with the suggestion of the division engineer, and the extension to the dam will have a similar slope. The main shafts for operating the discharge valves are too light, one of them at Lock No. 1 having been twisted in two. New shafts and operating gear have been purchased. \* \* \*

The following extract from the report of Mr. William Parkin, assistant engineer, gives more detailed information concerning the work done.

\* \* \* \* \*

At the close of last fiscal year nothing was being done at Lock No. 1 except caring for property, but active operations were commenced on July 28, when a small crew started framing and placing timber for the portion of the main dam inside of the lock coffer and excavating for the upper river crib. The dredge *Van Frank* started from Lock No. 2 on the same day to begin excavating for the dam at No. 1, but owing to low water the dredge had to dig through several shoals to get down the river, and did not arrive at Lock No. 1 until August 14, beginning the excavation for the dam the next day. In the meantime the excavation for the upper river crib had been completed by hand and construction commenced, this crib being completed August 26. The crib is 150 feet long, with a drift gap 10 feet wide at the head of the lock.

The lower land crib is only 20 feet long and had been brought to half height the season before. Work on this crib was begun on August 12 and completed on the 18th.

The excavation for the lower river crib was started with a derrick boat and orange peel bucket on October 25, but owing to the flanking of the abutment the crib was not entirely completed until December 8, 1902. This crib was also 150 feet long.

## 1422 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

As soon as a pile driver could be spared from the work at Dam No. 2 one was sent to Lock No. 1, and on the 11th of August the driving of triple-lap sheet piles on the upper side of the abutment was begun. The piles were all driven by August 19, which completed the abutment except backfilling on upper side, which was done shortly after.

### DAM.

The timber for the dam was all stored on top of the high bank about 600 feet above the dam, and the piles were so arranged that a track leading back from the river had piles of timber close by on each side. Beginning at the edge of the high bank an incline fitted with rollers was built down into the water, upon which the timbers for the dam slid into the river, the timbers being placed on the rollers from the car at the top of the hill. This proved to be a quick and cheap method of handling square timber in large quantities from the top of a long sloping bank to the water.

The dredge started excavation for the dam on August 15 by tearing out the old cofferdam, and completed the entire excavation on September 5, most of the excavation being gravel, though considerable loose rock and boulders were removed.

The actual construction of the dam was commenced on August 24; the first section, 80 feet long, swung into position on the 25th; the second section, of the same length, on September 2; and the third section, 150 feet long, on September 8.

The filling with stone was begun August 27 and completed October 1, the last sheeting driven October 11, and the water began going over the dam at 11.30 a. m., October 12, 1902. Puddling was started September 25 and completed on October 30, the most of it being placed by a side-dump scow that was built on the works, and the balance shoveled from barges by hand. Part of the backfill was gumbo and part gravel. It was all loaded on barges by the dredge *Van Frank*. As the south end of the dam rested on gravel, triple-lap sheet piles 9 by 12 inches were driven on the upper side of the dam for a distance of 110 feet out from the abutment, and on the lower side for a distance of 120 feet out from the abutment, the balance of the dam on the upper side being sheeted with double-lap 14-inch plank driven down among the boulders by hand. No trouble was experienced during the construction of the dam. The sections were built in the water at a point a few hundred feet above the work, the bottom being built to suit careful soundings previously taken. When the sections drew about all the water there was in the river between the dam site and the section it was towed to position, lined up, and building continued until it rested on the bottom. Only every other pen was filled with stone until after the last section of the dam was in place and weighted. The first two sections were swung into position by lines from the upper river guide crib, which extended 150 feet above the lock. The last 150-foot section was held by lines from the same place, and also by lines from two clumps of piles driven in a suitable position.

Two eight-hour shifts were used in the construction of the dam, working from 4 a. m. to 8 p. m., ten minutes being allowed for lunch at 8 a. m. and 4 p. m. As driving sheet piles is a slow job at best, three shifts of eight hours each was used when on that work. Before the completion of the dam such timber as was thought necessary was cut from the banks between Locks No. 1 and No. 2.

### FLANKING OF ABUTMENT.

As stated in a special report made to you on that day, the river began running over the top of the abutment on November 19, and early in the week a break was seen below the abutment in the grouted riprap at the lower end, extending back about 40 feet, upstream 35 feet, and the paving had fallen vertically about 5 feet. A timber bulkhead was at once started on top of the abutment to turn the water over the dam and away from the paving, and as a temporary protection this was successful. The break was filled with riprap as soon as possible and on the 24th a protection crib started below the abutment, and every available man and team was hired to hurry its construction and push the delivery of riprap, with which a large part of the bank was covered to a depth of several feet.

The work, however, was delayed very much by rain, in which many men absolutely refused to work, or even let their teams work, and on the night of November 25, about 12 p. m., the river flanked the abutment and turned the stem of same completely over (the points of the piles sticking up above low water), the break being about 200 feet wide the next morning.

On account of the very swift current at the end of the dam, it was necessary to protect the end of the structure from undermining, and to this end there was placed 523 cubic yards of large derrick stone at and along the outboard end of the dam. Considerable of the backfill was lost on account of this swift current.

*Apron of dam.*—Up to December 31, 1902, the river remained too high for any examination to be made of the dam, but on that date an examination revealed the fact that the frequent rises had considerably damaged the apron, there being two separate places, each about 30 feet long, where the decking had gone out entirely, and one section about 80 feet long in which the lower edge of the apron had raised 2 feet. One hundred and two cubic yards of large derrick stone was at once placed on the damaged apron to hold it in place during the winter floods, and until the river got low enough to permit of repairs being made.

As the 324 feet of dam already built has been ordered changed from a step to a slope dam, it will be necessary to remove all the step decking, and the large stone will be removed and repairs made when the change in shape of dam is undertaken.

*Lock gates.*—It was intended to complete the excavation of the lower lock approach after the construction of the dam, and this work was in progress when the abutment was flanked, but was then suspended, as the new dam could not be put in until the next low-water season. With a view to reducing the probable amount of deposit in the lower approach during the coming winter, both the upper and lower lock gates were chained back to the walls, leaving the water free to run through the lock and keep the lower approach scoured out. During the night of December 15, 1902, the lower gates broke their fastenings and swung around against the miter sill with such force as to rack them out of shape considerably, the top of the land gate at the toe being about 5½ feet farther downstream than the river gate, which broke loose a few minutes after the land gate. The closing of the lower gates stilled the water enough to render safe the closing of the upper gates, although there was 25 feet of water on the lower miter sill.

Very little of the iron work is damaged, but it is possible that the gates may have to be taken down to be properly repaired. It is proposed to do this work when the new valve gear is put in.

*Lock house, fencing, etc.*—The lock house is a duplicate of the one built two years ago at Lock No. 2, except that a full instead of a half cellar was put in. Excavation for the foundation was started October 7, 1902, the house completed February 5, 1903, and the office force moved into it the following week. A cistern was built for the lock house with a capacity of 3,200 gallons. It was walled with brick and plastered with cement.

During December and January a plank fence with good cedar posts was built around the lock grounds proper, the total length of fence being 1,056 feet.

*Survey of pool No. 1.*—A survey of pool No. 1, to determine the amount of overflowed land, was started soon after the pool filled and was carried to a point about 5 miles above Lock No. 1, when field work was suspended on account of the lowering of the pool by the flanking of the abutment. The survey has been mapped as far as made.

*Warehouse.*—A warehouse 29 by 70 feet has been built at the ship yard just above the lock, most of the lumber coming from a 30 by 70 foot warehouse in Little Rock, which was wrecked, and brought to Batesville by the U. S. snag boat *Quapaw*, arriving April 26, 1903. A track was built through the house and run down the bank to elevation 286, to expedite the handling of heavy materials and property.

*Work to be done.*—The following work has yet to be done, viz: (1) Build new abutment; (2) put in protection crib below same; (3) pave abutment slope; (4) revet bank below crib; (5) build levee from abutment back to high ground; (6) construct about 344 linear feet of dam; (7) raise apron of present dam (324 feet long) 3 feet and change from step to slope dam; (8) repair lower lock gates; (9) place new valve shafts and gearing; (10) remove temporary buildings and grade lock yard.

At present a force is employed on the construction of a new hull for the *Cleveland*, and the dipper dredge *Van Frank*, assisted by a large derrick with an orange-peel bucket, is excavating for the foundation of the new abutment.

\* \* \* \* \*

#### LOCK AND DAM NO. 2.

At the close of last fiscal year there was nothing but repair work in progress, and the general conditions were about as follows:

The lock was built and the valves and ladders set; the space behind the land wall of the lock had been filled with gravel; the lock tender's cottage built; the concrete abutment completed and part of the pile revetment below same built, and the timber extension of the abutment completed, the latter being virtually a dam 250 feet long connecting the abutment with a high bank in the rear, which does not overflow.

The following are the main items of work accomplished during the fiscal year ending June 30, 1903, viz: (1) Excavated for, built, and backfilled the 250-foot section of dam on piles which sets outside the main channel of the river; (2) excavated for and built the upper river guide crib and (3) the upper land crib; (4) built and



placed both sets of lock gates; (5) placed operating gear, snubbing posts, etc., and cut gear seats for new valve gears; (6) built the bank revetment below the lock; (7) tore down the lower arm of the old lock cofferdam; (8) finished as much of the paving behind the land wall as can be done (about three-fourths of it) until the temporary buildings are removed; (9) built part of the revetment below the abutment; (10) stacked at the north end of the dam all the timber that had been delivered at Earnheart switch for the main dam.

*Abutment revetment.*—Work was begun July 14, when excavation for the sheet-pile revetment below the abutment was begun. A double shift was put on the work and the excavation was accomplished on the 18th. The round piles in this revetment drove so hard that it was decided not to attempt driving the sheet piles, but to protect the bank by a timber crib filled with stones, and this will be built during the coming season.

*The 250-foot dam on piles.*—The dredge *Van Frank* started excavating for this section of the dam on July 19, completed the cut on the 25th, and started for Lock No. 1 on the 28th. As the bank through which the dredge had to cut was about 12 feet above low water, the waste pile soon became so high that the dredge could not swing over it and a double shift of teams (sixteen hours) was used to keep the dirt out of the way of the dredge working eight hours.

Driving round piles for the foundation of the dam was begun with a double shift on two pile drivers July 28 and completed August 6. Driving triple lap 9 by 12 inch piles with two drivers was begun August 2 and completed on the 22d, two shifts being used up to the 8th, and after that three. The first timbers placed were the caps for the sheet pile drivers to rest on, but real timber construction began the day the sheet piling was finished (August 22) and was completed November 14.

As this part of the dam is out of the main channel and above ordinary low-water stages, it was feasible to place the stone filling from wagons, and this was done, a wagon road being constructed on top of the dam from which the stone was thrown into the pens on each side. This filling was completed November 14.

The dam was backfilled with teams, work being started October 24 and finished November 15. Most of the crew was sent to Dam No. 1 when the pile driving at Dam No. 2 was completed.

*Paving behind land wall of lock.*—This work was started October 2 and was suspended for the season November 11 on account of the temporary buildings, which will have to be removed before the paving can be completed. About three-fourths of the work is done.

The paving is laid on a bed of gravel and a good portion of the paving blocks were cut to shape in the woods, the balance being cut from ordinary riprap stored on the yard.

*The 200-foot bank revetment below lock.*—This revetment has not the ordinary brush mattress foundation, as the toe of the riprap slope is among the boulders on the rock bottom of the river. The bank below the lock was graded to a slope of 1 on 2 and the paving carried to the top of the bank. The work was started November 10 and finished December 17.

*Upper land crib.*—A small portion of the crib next to the head of the lock had been placed the year before, to serve as a footing for the riprap protection upstream from the upper wing wall of lock. Excavation for the foundation of the remainder of the crib was begun November 17 and the crib completed, except the decking, December 11. The crib flares toward the shore and is 55 feet long.

*Upper river crib.*—This crib is 150 feet long, with a 10-foot drift gap next to the wall. The excavation was started January 8, and considerable dynamite was used among the immense boulders before a level bed could be secured upon which to build the crib. The work was all done, except decking, February 28, and all of the pens are filled with stone except three.

*Lower river crib.*—Since the completion of the other cribs several attempts have been made to build the structure, but owing to the frequent rises, during which the work was stopped and the silt was deposited several feet in depth, the work was finally abandoned, and the crib will be put in just before the main dam is built. The tearing out of the lower arm of the cofferdam was charged to this work.

*Lock gates.*—The construction of the gates was begun January 5, and they were completed May 5. The upper gates were placed March 30 to April 4 and the lower gates May 5 to 11. All the operating machinery, snubbing posts, etc., have been placed.

In setting the lower gates it was necessary to coffer off the pit with a needle dam and pump out the pit. Doing this occupied the time from April 21 to May 4, the footing for the needles being so irregular that the leakage was too great for the pump to overcome. After the gates were finally placed an attempt was made to put in a new needle sill, but a sudden rise flooded the pit early the next morning, and the new sill will be placed when the new valve gears are put in.

## MISCELLANEOUS.

Discharge observations: Nine observations have been made for discharge during the past year, two of which were at quite high stages. The results are given in the table below.

*Discharge observations, Upper White River, Arkansas.*

[Maxwell Gin is 2 miles below Lock No. 2. Site for Lock No. 3 is 12 miles above lock No. 2.]

Locality.	Date.	Lock 2 lower sill gauge.	Water width.	Mean depth.	Area.	Average velocity.	Dis- charge.
	1902.	<i>Fect.</i>	<i>Fect.</i>	<i>Fect.</i>	<i>Sq. feet.</i>	<i>Ft. per sec.</i>	<i>Cu. ft. per sec.</i>
Maxwell Gin .....	July 2	13.4	473	13.9	6,590	4.405	29,025
Do.....	do	13	470	14	6,583	4.395	28,919
Do.....	July 3	12.5	455	13.1	5,951	4.11	24,458
Do.....	do	11.9	445	12.7	5,675	3.65	20,703
Do.....	July 5	9	404	11.6	4,696	2.761	12,965
Do.....	do	8.8	403	11.6	4,656	2.672	12,441
Do.....	July 9	6.2	375	9.5	3,570	1.48	5,282
	1903						
Site for Lock No. 3 .....	May 22	20.8	820	15.4	12,644	5.849	73,959
Do.....	June 5	19.1	820	15.7	12,841	6.34	81,386

*Miscellaneous.*—The gear pits have been cut for the new valve gear, timber cleared from the bank above the lock, minor repairs made to machinery and property; a tramway 2,079 feet long built to facilitate the handling of timber from the railway to the dam, and all the timber so far received for the dam transferred from the railroad switch to the north end of the dam, where it has been carefully stacked, it being the intention to delay the construction of Dam No. 2 until Dam No. 1 is built. About 890 cubic yards of stone has been delivered for filling the main dam and probably two-thirds of the timber.

The section of dam on piles built this year is to be changed from a step to a slope dam, and this work will be done during the present low-water season if the timber can be secured.

\* \* \* \* \*

The following work is yet to be done: (1) Change 250 feet of dam already built from a step to a slope dam; (2) construct 410 feet of slope dam; (3) build lower river and (4) land cribs; (5) place new valve shafts and gear; (6) complete paving behind the land wall; (7) remove the temporary buildings, and (8) grade and (9) fence the grounds.

*Floating plant.*—At various times during the past year the different pieces of floating property have been repaired as per statement below. They are all in good condition except the quarter boat *Albany*, which was beached and wrecked in June, such timber from the cabin as could be used again being stored at Lock No. 2.

*Barge No. 1.*—Calked all around; redecked with 2-inch pine.

*Barge No. 2.*—Same.

*Barge No. 3.*—Gunwales calked; 32 new deck plank put in.

*Barge No. 4.*—Removed scab deck of 1-inch oak and recalked pine deck.

*Barge No. 5* (dump scow).—Put in 5 new door arms.

*Derrick boat No. 1.*—No repairs to boat proper, but the upright Mundy boiler had new door flanges put in.

*Dredge Van Frank.*—This boat was too wide over all to pass through the locks, and to remedy this difficulty the boat was cut down on each side 2 feet in width for a distance of 10 feet back from the head, and the anchors set in the recess thus made. To strengthen the hull, which was built in 1896, and also to form a new gunwale for the recesses cut out for the anchors, a 10-inch bulkhead, 72 feet long, was put in on each side, 2 feet from the old gunwales.

New anchors have been put in and all the anchors shod with steel shoes. A new foundation was built under the boom and new cast-steel top and bottom castings put in place of the old iron castings at the foot of the boom. The old boom guys were removed and larger ones substituted, and the trunnion ring and strap at the head of the A frame was replaced by new and larger ones.

A special dock was placed under the stern and entirely new stern anchor frames put in. New foot blocks were placed for the A-frame guys, and an auxiliary chain

put in which takes hold at the stern transom. The boat has been side docked all around, six new gunwale planks put in, each 32 feet long, and both rakes and sides calked above and below the water line. New canvas roof was put on both the hurricane and boiler decks, and the cabin painted inside and out.

The dipper was thoroughly overhauled and the bottom half-soleed.

*Towboat Cleveland.*—This boat had only minor repairs during the year, and her cabin and machinery are now being placed on a new model hull, 20 feet by 110 feet.

The timber for the boat should have been delivered in January, but none of it had been delivered to March 17, upon which day a small mill near Lock No. 2 was hired and enough timber cut from the stock on hand for Dam No. 2 to build the boat. The first frames were set up April 13, the hull launched May 21, and the cabin transferred from the old to the new hull May 29.

*Recommendations regarding future operations.*—When this project was adopted there was no railway in the upper White River Valley above Batesville, and all that section of country was dependent either upon wagon transportation over mountain roads to railways quite a distance off or upon the very uncertain transportation by boat down the White River to Batesville, where railway connection could be made. Neither the large quantities of zinc ore in Marion, Boone, Baxter, Newton, and Searcy counties, of Arkansas, nor the fine marble beds in this section could be operated with profit because no facilities existed for cheap transportation; hence it appeared that the improvement of this stream for all the year round navigation should be undertaken by the General Government. Batesville, being a railway point, and Buffalo shoals, being near the southeastern border of the mineral belt, were selected as the terminals of the section of the river to be improved. This arrangement made the St. Louis, Iron Mountain and Southern Railway, at Batesville, the final carrier of any commerce arising on upper White River and destined to a distant point. The White River between Batesville and Jacksonport (38 miles below) is not navigable all the year; therefore this project, if carried to completion, would make of Upper White River an isolated improvement. Having in view only the making of an outlet for the upper White River country and remembering that the markets are to the north and east, there would not have been much gained by extending this project down to the naturally deep water below the mouth of Black River, for Newport would have simply been another point of connection with the Iron Mountain Railway system. It is true that a railway connection would have been offered at Jacksonport, but at that time the White and Black River Railway, which has a terminus there, was only a local road. Railway conditions in the upper White River country are different now. The St. Louis and Northern Arkansas Railway Company has built a road from the Eureka Springs branch of the St. Louis and San Francisco Railroad to Marshall via Harrison, thus entering the mineral belt from the west. The White River Railway Company, a St. Louis, Iron Mountain and Southern Railway enterprise, is now building a road from Batesville, Ark., to Carthage, Mo. This line follows directly up the White River Valley from Batesville to Cotter, where it crosses and leaves the White River, entering and passing through one section of the mineral belt. During the past year this road was carried from about the proposed location of Lock No. 3 to Cotter, and is now operated to Buffalo City, the upper limit of this project. Within a short time train service will be established to Cotter, a new town about 1 mile below McBees Landing and 12 miles above Buffalo City. These roads of course furnish better transportation facilities than have heretofore existed and

it is to be expected that the country will be filled rapidly with settlers and that several small towns will be established. From this probable increase in population, and hence in business, it might be argued that commerce on upper White River will be increased through the building of these new railways, but, when one takes into consideration the fact that the final outlet as well as the initial inlet to any commerce that may pass over the river is the railway, this argument seems unsound. It is hardly probable that shippers will elect to transfer freights from a railway to boat for only a short-distance shipment on the river when the railway from which it was transferred passes through the same point of destination; similarly with commerce originating on White River within the limits of this project. If the original loading be on boat it is but a short distance until the freight must be removed from the boat and be loaded onto the very railway that passed through the point of origin of the freight. These points are very well exemplified by the action of the cedar dealers on upper White River this year. For many years the upper White River country has been the source of supply for large quantities of cedar. This was rafted down the river to Batesville, Jacksonport, and Newport, at which points it was transferred to railways for shipment to final destination. But now, since train service has been established on the White River Railway, the cedar men are buying the cedar delivered at the various sidings along the railway, thereby saving one handling of the cedar. That there is much mineral, marble, and good building stone in the upper White River country there is no doubt; however, no great quantities of the really valuable natural products of the country lie directly on the river. The manganese lies to the north and northwest of Batesville. The Cushman branch of the St. Louis, Iron Mountain and Southern Railway runs through a portion of the manganese district. No river commerce can be expected from this source. It would be unreasonable to expect a shipment from these mines to a river over which the ores can not be transported, for it is to be remembered that the White River between Batesville and Jacksonport is not navigable at all times. The phosphate beds which lie about 5 miles from the river are connected to the main line of the railway by a short branch line. These beds will similarly not give the river any commerce, for the river can not take the material to a market. The limestone and marble quarries, as well as the lime kilns (yet to be established), can not be served by the river for the reason mentioned in connection with the manganese and phosphate beds. Now, as to the zinc. This is supposed to be the most important of the, as yet, partially developed resources of the country. Although large amounts of money have been expended in the opening of mines, it may be said that the development has hardly passed through the prospecting stage. The most zealous of those interested in the development of this section of country claim that it will rival in output the Joplin district of Missouri, which has a weekly output of about 5,000 tons of zinc and 500 tons of lead ores. Whether their hopes will be realized is a question for the future to answer, though there are strong indications that this section is really a continuation of the Missouri zinc fields. Notwithstanding these conditions, it does not appear that the completion of this project for the improvement of upper White River will be of any material benefit in the development of the country. Accompanying this is a sketch map showing the location of the zinc fields. It is not to be inferred that zinc is to be

found everywhere in the shaded areas. The districts shaded represent that part of the country in which zinc, lead, and manganese occur at varying intervals. The area of the zinc fields is 2,000 square miles, in round numbers, of which approximately 225 square miles is proven ground; that is, ground upon which zinc is known to be in sufficient quantities to pay for working it. It will be noticed that the portion of White River covered by this project lies nearly entirely outside of the zinc field. The shaded area in the vicinity of Calico Rock is not yet proven ground. In this area some zinc in small quantities outcrops on the west of the river about 5 miles south of Calico Rock, some about 7 miles northeast of Calico Rock, and some shows in the railway cuts just south of Calico Rock.

After the zinc and lead ores are mined they may be disposed of in one or all of three ways; first, they may be shipped to the northern smelters; second, they may be exported, and, third, smelters can be established in the zinc fields and the ores reduced there. In the first case, no river commerce will arise, as the river does not lie in the route of the shipment. In the second case, the river would lie in the route of shipment if New Orleans were the point from which export is made, but in this case the interrupted navigation between Batesville and deep water below Jacksonport would prevent the use of the river. There is at present a project on foot to use New Orleans as a point for export, the scheme being to build a line of railway from Newport up the west bank of White River to the zinc fields, this railway to operate in connection with a barge line to be run between Newport and New Orleans. The promoters of this enterprise represent that the necessary bonds have been floated and that actual construction of the railway will begin soon. In the third case, fuel for the smelters would be a source of commerce for some transportation line, but not the river, for the coal fields from which the fuel would naturally come lie in Kansas and Indian Territory, which are to the northwest, west, and southwest of the zinc fields, again making the river not in the route of shipments. In consideration of the above it appears that the only commerce to be materially benefited by the completion of this project is that arising or that which will arise as local business in the valley within the limits of this improvement. In years past this has been small, and it is not probable that it will be large for many years to come. The valley proper has been settled for a long time and the better portions of it have been under cultivation for many years, therefore, there can not be any great increase in agricultural products over that of past years. It is possible that with the increase of population other lines of farming may be entered into and some additional lands put under cultivation. This increase of population will also tend to increase the local business; however, it is thought that this can not be sufficient to justify the expenditure of \$1,600,000 for original improvement upon which the annual maintenance cost would be considerable. Taking into consideration the transportation facilities now afforded the upper White River country and the slight prospect of any material increase in the river commerce, it is my opinion that this project should either be abandoned upon the completion of the two locks and dams now under construction or extended to include the river from Batesville down to the naturally deep water below Jacksonport. I must, therefore, in compliance with the law, report that I deem this river between Batesville and Buffalo shoals as unworthy of further improvement after the

completion of Locks and Dams Nos. 1 and 2, and must recommend the discontinuance of appropriations for this work after the completion of those two locks is provided for. The flanking and destruction of the abutment at Dam No. 1 will entail not only the building of a new abutment, but also the purchase of additional land for its site and the building of 340 linear feet of dam. The cost of this work will reduce the amount available for application to Lock and Dam No. 2 to such an extent that \$12,500 will be needed to complete that work in addition to the balance available June 30, 1903.

In submitting the report<sup>a</sup> upon the preliminary examination of this stream the Chief of Engineers gave it as his opinion that the river was unworthy of improvement. Congress, however, adopted the project, and it may now refuse to accept this recommendation for abandonment. If so, and the work is to be continued, the next appropriation should be for \$223,500; \$12,500 being for the completion of Lock and Dam No. 2, and \$211,000 being for the building of Lock and Dam No. 3.

*Money statement.*

July 1, 1902, balance unexpended .....	\$279, 181. 15
June 30, 1903, amount expended during fiscal year .....	\$93, 643. 16
Less sales .....	20. 50
	<hr/> b 93, 622. 66
July 1, 1903, balance unexpended .....	185, 558. 49
July 1, 1903, outstanding liabilities .....	18, 634. 65
	<hr/>
July 1, 1903, balance available .....	166, 923. 84
	<hr/>
July 1, 1903, amount covered by uncompleted contracts .....	23, 015. 98
	<hr/>
{ Amount (estimated) required for completion of existing project .....	1, 020, 000. 00
{ Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903 .....	12, 500. 00
{ Submitted in compliance with requirements of sundry civil act of June 4, 1897.	

APPROPRIATIONS.

March 3, 1899 .....	\$160, 000. 00
June 6, 1900 .....	150, 000. 00
June 13, 1902 .....	270, 000. 00
	<hr/>
Total .....	580, 000. 00
Expended to June 30, 1903 .....	394, 441. 51
	<hr/>
Unexpended July 1, 1903 .....	185, 558. 49

<sup>a</sup> House Document No. 98, Fifty-fourth Congress, first session, or Annual Report Chief of Engineers, fiscal year 1896, p. 1697.

<sup>b</sup> Lock No. 1, \$42,363.17; Lock No. 2, \$51,259.49.

# 1430 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

## CONTRACTS.

Name and address of contractor.	Nature of contract.	Rate.	Contract approved.	Work began.	Expiration of contract.
Robt. W. Earnheart, Batesville, Ark.	5,000 cubic yards stone.	70 cents per cubic yard.	1903.	1903.	1903.
	do	73 cents per cubic yard.	Mar. 24	Not begun.	June 1
	198,915 feet B. M. lumber.	\$14 per 1,000 feet B. M.			
Bryant Lumber Co., Silica, Ark. <sup>b</sup>	102,725 feet B. M. lumber.	\$13 per 1,000 feet B. M.	Mar. 23	Apr. 3	(c)
	106,337 feet B. M. lumber.	\$12 per 1,000 feet B. M.			
	184,800 feet B. M. lumber.	\$9.50 per 1,000 feet B. M.			
W. B. Ferguson, Little Rock, Ark. <sup>b</sup>	160,233 feet B. M. oak timber.	\$15 per 1,000 feet B. M.	Apr. 1	May 27	Aug. 15
Uranla Lumber Co. (Limited), Alexandria, La. <sup>b</sup>	259,297 feet B. M. pine timber.	\$9 per 1,000 feet B. M.	Apr. 6	Apr. 16	Do.
Edwin S. Healey, St. Louis, Mo. <sup>b</sup>	2,600 barrels cement (Lehigh).	\$2.70 per barrel	May 2	June 18	July 15

<sup>a</sup> Extension for a reasonable time. <sup>b</sup> Emergency contract. <sup>c</sup> Part June 1; part July 1, 1903.

## COMMERCIAL STATISTICS.

Navigation was suspended during low-water periods. No steamboat reported going above McBees Landing. Full report of commerce was not received.

List of boats that navigated Upper White River, Arkansas, from May 31, 1902, to June 1, 1903.

Name.	Net tonnage.	Draft loaded.		Between—	Round trips.	Passengers.
		Steamers.	Barges.			
		<i>Ft. in.</i>	<i>Ft. in.</i>			
Eureka	57	1 6		(Batesville and Buffalo shoal.....	1	
				Batesville and Devro .....	1	
				Devro and Cotters .....	1	6
				Penters Bluff and Buffalo shoal ..	26	
Gen'l Joe Wheeler	65	2 6	1 8	Newport and McBees .....	2	
				Batesville and McBees .....	7	758
				Mount Olive and McBees .....	4	
				McBees and Devro .....	3	
Ozark Queen <sup>a</sup> .....	136	3 0		Batesville and McBees .....	9	161
Myrtle Corey .....	9	2 0	1 8	Penters Bluff and Cotters .....	46	27
Quickstep .....	66	2 6		Batesville and Buffalo City .....	1	27
Welcome .....	45	2 0	3 6	Mount Olive and Buffalo City .....	27	190
Kennedy .....	126	3 0	3 0	Mount Olive and Barren Creek .....	15	300
Buck Elk .....	58	2 6	1 2	Penters Bluff and Buffalo City .....	95	950

<sup>a</sup> Owners-hip changed Mar. 15, 1903. No report received from the former owner.

Classification of commerce reported year ending May 31, 1903.

Articles.	Tons.
Cotton and cotton seed .....	613
Lumber .....	5,146
Provisions .....	1,957
Railway ties .....	2,432
Square timber .....	1,476
Cedar .....	860
Grain .....	1,239
Miscellaneous freights .....	2,592
Total tonnage reported .....	16,315

Estimated value, \$737,070.

## Y 4.

## IMPROVEMENT OF CACHE RIVER, ARKANSAS.

*Operations this fiscal year.*—The work on this stream was done by a chopping party quartered in tents. The camp equipment was sent to the river early in September, 1902, and active operations begun at James Ferry (79 miles above the mouth) on the 8th of the month, and were continued without any interruption to the mouth of the river, which was reached October 28, when the equipment was shipped to St. Francis. Four hundred and fifty-five snags were removed, 578 trees cut, 279 drift piles broken up, 708 trees deadened, overhanging limbs cut off of 504 trees, 584 sunken and abandoned saw logs cut into 8 and 10 foot lengths, the hull of the sunken steamer *Black Diamond* broken up, and 60 linear feet of an abandoned milldam removed. The snags were cut as far below the water surface as practicable with saws and dynamite. Before operations began the river from James Ferry to Maberry Landing was in bad condition, overhanging timber, drift piles, snags, and sunken logs lining the river all the way, and at places the river was entirely blocked. Below Maberry the river was in much better condition, that being the portion worked over in the fiscal year 1900. The conditions were favorable for obtaining satisfactory results this year, the river being at very low stage when the work was done, and the full natural depths were rendered available for navigation. To maintain the channel opened and cleared this year \$2,000 are required annually.

*Money statement.*

July 1, 1902, balance unexpended .....	\$2,000.00
June 30, 1903, amount expended during fiscal year .....	1,990.00
July 1, 1903, balance unexpended .....	10.00
July 1, 1903, outstanding liabilities .....	10.00
<hr/>	
Amount that can be profitably expended in fiscal year ending June 30, 1905, for maintenance of improvement in addition to the balance unexpended July 1, 1903 .....	2,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

## APPROPRIATIONS AND ALLOTMENTS.

August 11, 1888, mouth to Riverside .....	\$7,000
July 13, 1892, mouth to Riverside .....	2,000
August 17, 1894, allotted from White River .....	2,000
June 3, 1896, allotted from White River .....	2,000
March 3, 1899, mouth to James Ferry .....	1,000
June 13, 1902, mouth to James Ferry .....	2,000
Total .....	16,000
Expended to June 30, 1903 .....	15,990
Unexpended July 1, 1903 .....	10



# 1432 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

## COMMERCIAL STATISTICS.

The river was too low for navigation from June 1, 1902, to the latter part of November, 1902. Lumbering and kindred industries produced all of the commerce, 50 per cent of which was rafted.

*List of boats that navigated Cache River, Arkansas, between May 31, 1902, and June 1, 1903.*

Name.	Net tonnage.	Draft, loaded.		Between—	Round trips.	Passengers.
		Steamer.	Barges.			
		<i>Fl. in.</i>	<i>Fl. in.</i>			
Susan.....	178	4 0	4 6	DeValls Bluff and tie camps.....	22	.....
Gladys Maberry....	41	3 0	4 0	Cache bridge and tie camps.....	4	.....
Mary F. Carter.....	50	2 6	3 6	Cache bridge and Maberry.....	25	.....
				Clarendon and Cache bridge.....	1	.....

*Classification of commerce reported year ending May 31, 1903.*

Articles.	Tons.
Staves and bolts.....	500
Saw logs.....	5,900
Railroad ties.....	9,993
Miscellaneous freights.....	450
Total tonnage reported.....	16,843

Estimated value, \$109,681.

## Y 5.

### IMPROVEMENT OF BLACK RIVER, ARKANSAS AND MISSOURI.

*Operations this fiscal year.*—After making miner repairs, the hand-propelled snag boat *Riverside* began snagging operations at Corning, Ark., August 25. The boat worked up to Poplar Bluff, arriving there November 8. From Poplar Bluff it worked down to the mouth of Current River, which point was reached December 23. It then went into Current River.

The snag boat *Quapaw*, the building of which is reported upon in detail in report for improving White River, Arkansas, began work in this river in June. When the boat entered the river the stream was at about bank-full stage, therefore the first operations were confined mainly to cutting overhanging timber. The boat worked up to Pocahontas, then, as the river had fallen to about 6 feet above low water, it returned to the mouth of the river to rework that portion passed over early in the month. At the close of the year she had worked up to Gibson Mill (18 miles above the mouth.)

The work accomplished by the two boats is shown in the table below.

Boat.	Work done between—	Distance.	Snags destroyed.	Drifts broken up.	Trees cut.	Miles run.
		<i>Miles.</i>				
Riverside.....	Current River and Current River.....	123	655	31	3,490	175
Quapaw.....	Mouth of Black River and Current River.....	116	107	3	604	312
	Total mouth of Black River and Poplar Bluff.	339	762	34	4,094	.....

*Recommendations for future operations.*—The snag boat *Riverside* will return to this river about August 15, 1903, and work from Cur-

rent River up to Poplar Bluff. The *Quapaw* will work below the mouth of Current River during July, September, and November, 1903. These operations will exhaust practically all of the available funds. The estimated available balance December 15, 1903, when operations will cease, is only \$840. This will be reduced by care of property expenses to about \$110 June 30, 1904. To give the river the attention demanded by the commercial interests, the *Quapaw* should be operated below the mouth of Current River about four months and the *Riverside* above the mouth of Current River about seven months each year. To do this and care for the boats during periods of no operations \$15,000 are required annually. The river is believed to be worthy of this expenditure. The present hull of the snag boat *Riverside* was built in May and June, 1896. It has had very hard service and by the close of the present working season, December, 1903, will be worn and rotted out, or so much so that it will need to be rebuilt; such rebuilding, however, would not enable the boat to go longer than one more season. The hulls for the hand-propelled boats, of which type the *Riverside* is, are nothing more than decked scows and cost only about \$1,750, including the cost of transferring to them the upper works, capstans, and boiler from the old hull, therefore it is thought better to build new hulls out and out than to attempt extensive repairs for short service. Adding the cost of such new hull to the \$15,000 mentioned as necessary for operating the snag boats, makes \$16,750 required for the fiscal year ending June 30, 1905. Every mile of the river covered by the project is actually navigated by steamboats. The commerce reported this year is not a fair index of the business of the river. The rainy season began in November and high waters continued till in June. This condition kept so much water in the bottoms that the timbermen could not get to the timber.

*Money statement.*

July 1, 1902, balance unexpended .....	\$21, 706. 54
June 30, 1903, amount expended during fiscal year .....	10, 958. 67
July 1, 1903, balance unexpended .....	10, 747. 87
July 1, 1903, outstanding liabilities .....	1, 307. 72
July 1, 1903, balance available .....	9, 440. 15
{ Amount that can be profitably expended in fiscal year ending June 30, 1905, for maintenance of improvement, in addition to the balance unexpended July 1, 1903 .....	
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	
	16, 750. 00

APPROPRIATIONS.

Appropriations have been made for this stream separately under the heads of "Improving Black River, Missouri," "Improving Black River, Arkansas," and "Improving Black River, Arkansas and Missouri." They are as follows:

June 14, 1880 .....	\$15, 000. 00	August 18, 1894 .....	\$9, 500. 00
March 3, 1881 .....	6, 000. 00	June 3, 1896 .....	8, 000. 00
August 2, 1882 .....	10, 000. 00	March 3, 1899 .....	8, 000. 00
July 5, 1884 .....	20, 000. 00	June 13, 1902 .....	21, 700. 00
August 5, 1886 .....	5, 000. 00		
August 11, 1888 .....	5, 000. 00	Total .....	132, 200. 00
August 11, 1888 .....	7, 000. 00	Expended to June 30, 1903 ..	121, 452. 13
September 19, 1890 .....	5, 000. 00		
September 19, 1890 .....	7, 000. 00	Unexpended July 1, 1903 ...	10, 747. 87
July 13, 1892 .....	5, 000. 00		

# 1484 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

## CONTRACT (EMERGENCY).

Name and address of contractor: Ed J. Howard, Jeffersonville, Ind.

Nature of contract: New hull for snag boat *Beauregard*.

Rate: \$5,810.

Contract approved: July 23, 1902.

Work began: July 28, 1902.

Expiration of contract: November 10, 1902.

## COMMERCIAL STATISTICS.

Boats of not over 18 inches draft could navigate all the year to Poplar Bluff, Mo., and those of not more than 30 inches draft all the year to the mouth of Current River. A long period of high water reduced timber shipments considerably. Full report of rafted commerce was not received.

List of boats that navigated Black River, Arkansas and Missouri, between May 31, 1902, and June 1, 1903.

Name.	Net tonnage.	Draft, loaded.		Between—	Round trips.	Passengers.
		Steamer.	Barges.			
		<i>Ft. tn.</i>	<i>Ft. tn.</i>			
El Blanco.....	32	2 6	4 0	Black Rock and Poplar Bluff .....	39	
Bernice.....	6	1 4	1 0	Poplar Bluff and Corning.....	50	200
Louise.....	24	2 0	2 6	do.....	20	
Alma Jane.....	24	1 10	2 6	Poplar Bluff and State line .....	20	
Arthur.....	22	1 2	—	do.....	78	600
W. T. Harwell.....	24	2 0	3 6	Poplar Bluff and Carolla.....	5	8
Krata.....	31	3 0	5 0	Poplar Bluff and mouth of Dan River	6	12
A. R. Bragg.....	162	3 0	5 0	Poplar Bluff and Lake Slough .....	2	10
F. W. Tucker.....	99	5 0	5 0	Poplar Bluff and mouth of Dan River	5	6
C. E. Taylor.....	50	3 0	5 0	Black Rock and Current River .....	20	25
Currentview.....	33	1 4	3 0	Black Rock and Newport.....	50	150
Roy.....	24	1 10	2 6	Newport and Current River .....	75	300
Quickstep.....	66	2 6	5 0	Black Rock and Current River .....	20	20
Harry Waltz.....	63	1 8	4 0	Newport and Black Rock.....	104	288
				Poplar Bluff and Old River.....	110	
				Newport and Strawberry .....	5	19
				Newport and Pochahontas.....	18	25

## Classification of commerce reported year ending May 31, 1903.

Articles.	Tons.	Articles.	Tons.
Cotton and cotton seed .....	1,058	Railway ties.....	62,125
Lumber.....	20,310	Piling .....	812
Staves and bolts .....	12,690	Miscellaneous freights .....	1,344
Provisions .....	837		
Saw logs .....	39,005	Total tonnage reported.....	138,181

Estimated value, \$695,649.

## Y 6.

## IMPROVEMENT OF CURRENT RIVER, ARKANSAS AND MISSOURI.

*Operations this fiscal year.*—The hand-propelled snag boat *Riverside* came into this river December 24, 1902, but finding it at too high a stage for doing satisfactory work, lay up for the winter at Skinners Ferry, 11 miles above the mouth. Minor repairs were made to the

boat in May, after which she was towed to the mouth of Little Black River by the hired steamer *El Blanco*. Active operations were begun at that point May 22, and have been continued since that date. At the close of the year the boat was at Caughhorn Creek, 16 miles above the mouth of Little Black River and 7 miles above the State line between Arkansas and Missouri. One hundred and sixty snags were removed, 1 drift broken up, and 749 trees cut.

No work has been done above the State line since December, 1895. Many obstructions have accumulated since that time and the progress of the *Riverside* will be slow.

This appropriation also bears a portion of the cost of building the snag boat *Quapaw*, which is reported upon in detail in the report for improving White River, Arkansas.

*Recommendations for future operations.*—The hand-propelled boat *Riverside* will remain at work in this river until August 15, when it will return to Black River. The *Quapaw* will work in this river during August, at the close of which month it also will go back into Black River. The operations will use up the available balance, it being estimated that this will be reduced to \$300 by September 1, 1903. To operate the steam-propelled boat two months and the hand-propelled boat three months in the fiscal year ending June 30, 1905, \$5,750 are required for actual operating expenses. An additional \$1,000 will be needed for annual repair and care of plant during periods of no operations, thus making \$6,750 needed for maintenance during that fiscal year.

*Money statement.*

July 1, 1902, balance unexpended .....	\$6,912.97
June 30, 1903, amount expended during fiscal year .....	2,921.69
July 1, 1903, balance unexpended .....	3,991.28
July 1, 1903, outstanding liabilities .....	748.58
July 1, 1903, balance available .....	3,242.70
<div style="display: flex; align-items: center;"> <div style="font-size: 3em; margin-right: 10px;">{</div> <div>           Amount that can be profitably expended in fiscal year ending June 30, 1905, for maintenance of improvement, in addition to the balance unexpended July 1, 1903 .....            Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.         </div> <div style="margin-left: 20px; text-align: right;">6,750.00</div> </div>	

APPROPRIATIONS.

The early examinations of this river were made under appropriations for this in combination with other streams. The independent appropriations for this stream are as follows:

June 2, 1872, Current River, Missouri .....	\$5,000.00
March 3, 1881, Current River, Arkansas and Missouri .....	2,000.00
August 18, 1894, Current River, Arkansas and Missouri .....	8,000.00
June 3, 1896, Current River, Arkansas and Missouri .....	2,000.00
March 3, 1899, Current River, Arkansas and Missouri .....	5,000.00
June 13, 1902, Current River, Arkansas and Missouri .....	6,900.00
Total .....	28,900.00
Expended to June 30, 1903 .....	24,908.72
Unexpended July 1, 1903 .....	3,991.28

# 1436 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

## CONTRACT (EMERGENCY).

Name and address of contractor: Ed J. Howard, Jeffersonville, Ind.

Nature of contract: New hull for snag boat *Beauregard*.

Rate: \$5,810.

Contract approved: July 23, 1902.

Work began: July 28, 1902.

Expiration of contract: November 10, 1902.

## COMMERCIAL STATISTICS.

No steamboat reports going above the mouth of Little Black River (32 miles) this year. Saw logs and railway ties were rafted from all along the stream. Full report was not received of this class of commerce.

*List of boats that navigated Current River, Arkansas and Missouri, between May 31, 1902, and June 1, 1903.*

Name.	Net tonnage.	Draft, loaded.		Between—	Round trips.	Passengers.
		Steamer.	Barges.			
		<i>Ft. in.</i>	<i>Ft. in.</i>			
El Blanco .....	32	2 6	4 0	Black Rock and Little Black River.	28	.....
Krata .....	31	3 0	5 0	Black Rock and Johnsons .....	20	25
C. E. Taylor .....	50	3 0	5 0	do .....	20	20
F. W. Tucker .....	99	5 0	5 0	Newport and Johnsons .....	75	300

*Classification of commerce reported year ending May 31, 1903.*

Articles.	Tons.	Articles.	Tons.
Cotton and cotton seed .....	163	Square timber .....	455
Lumber .....	1,682	Miscellaneous freights .....	175
Staves and bolts .....	1,509		
Saw logs .....	26,145	Total tonnage reported .....	45,309
Railway ties .....	15,180		

Estimated value, \$142,899.

## Y 7.

### IMPROVEMENT OF ST. FRANCIS AND L'ANGUILLE RIVERS, ARKANSAS.

*Operations this fiscal year.*—The hand-propelled snag boat *A. B. Johnson* was pulled out on the bar at Madison August 10. Two gunwale pieces, 31 bottom plank, 13 rake plank, 20 deck beams, and 32 deck plank were renewed. The boat was recalcd all over and launched August 29. Active snagging operations were begun at Madison Bend September 2. From this place the boat worked down to Browns Bend (5 miles above the mouth), then up to Hunters Bend (82 miles above the mouth), where high water caused a suspension of operations on December 16. The boat was floated back to Madison (70 miles above the mouth), where it was laid up for the winter and the crew discharged December 22. In the 70 miles of river passed over by the *A. B. Johnson* 546 snags were removed, 1 drift broken up, and 1,297 trees cut.

The snagging operations on L'Anguille River were carried on by means of a self-subsisting party of laborers working with a small cata-

maran barge fitted with a steam crab. This party worked from Marianna to the confluence of L'Anguille and St. Francis rivers, a distance of 11 miles, during October and November. Five hundred and thirty saw logs and snags were removed from the channel of the river.

Since the suspension of operations some minor repairs have been made to the snag boat *A. B. Johnson*, and it is now in condition to resume operations as soon as the river falls to a suitable stage, which probably will be about July 10 or 15.

*Recommendations for future operations.*—The present hull of the *A. B. Johnson* was built in calendar year 1896. The material used was summer-cut yellow pine, and some of it was not of the very best quality. The hull has deteriorated rapidly and this fiscal year had to be hauled out and repaired extensively. By the time the snagging season of fiscal year 1905 comes the boat will be 8 years old. Judging from the life of other yellow-pine hulls, it is very doubtful if this one will be in condition to use then, and most likely will not be worth repairing; therefore the cost of building a new hull, \$1,750, should be added to the estimate for annual snagging, which is \$8,000, making \$9,750 required for fiscal year ending June 30, 1905, in addition to the balance available June 30, 1903.

The funds now available will be expensed in operating and caring for the snag boat *A. B. Johnson*.

#### *Money statement.*

July 1, 1902, balance unexpended .....	\$9,005. 15
June 30, 1903, amount expended during fiscal year .....	4,809. 32
July 1, 1903, balance unexpended .....	4,195. 83
July 1, 1903, outstanding liabilities .....	201. 39
July 1, 1903, balance available .....	3,994. 44
Amount that can be profitably expended in fiscal year ending June 30, 1905, for maintenance of improvement, in addition to the balance unexpended July 1, 1903 .....	
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	
	9,750. 00

#### APPROPRIATIONS.

The earlier examinations and the earlier operations were made under appropriations for these in conjunction with other rivers. Of the expenditures under those appropriations this office has no record.

The separate appropriations are as follows:

March 3, 1871, St. Francis River, Arkansas .....	\$10,000. 00
June 14, 1880, St. Francis River, Arkansas .....	5,000. 00
July 5, 1884, St. Francis River, Arkansas .....	12,000. 00
August 5, 1886, St. Francis River, Arkansas .....	8,000. 00
August 11, 1888, St. Francis River, Arkansas .....	4,000. 00
September 19, 1890, St. Francis River, Arkansas .....	4,000. 00
August 18, 1894, St. Francis River, Arkansas .....	" 83,000. 00
June 3, 1896, St. Francis River, Arkansas .....	8,000. 00
March 3, 1899, St. Francis River, Arkansas .....	8,000. 00
June 18, 1878, L'Anguille River .....	10,000. 00
March 3, 1879, L'Anguille River .....	5,000. 00

<sup>a</sup> Seventy-five thousand dollars of appropriation of August 18, 1894, was expended by the Mississippi River Commission for levee construction.

# 1438 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

June 14, 1880, L'Anguille River .....	\$2,000.00
June 13, 1902, St. Francis and L'Anguille rivers, Arkansas .....	9,000.00
Total for St. Francis and L'Anguille rivers, Arkansas .....	168,000.00
Expended to June 30, 1903:	
Old projects .....	\$84,000.00
New project .....	4,804.17
	<u>88,804.17</u>
Unexpended July 1, 1903 .....	4,195.83

## COMMERCIAL STATISTICS.

These rivers were too low for navigation during the months of September and October.

*List of boats that navigated St. Francis and L'Anguille rivers, Arkansas, from May 31, 1902, to June 1, 1903.*

Name.	Net tonnage.	Draft loaded.		Between—	Round trips.	Passengers.
		Steamers.	Barges.			
		<i>Ft. in.</i>	<i>Ft. in.</i>			
L. E. Patton .....	92	4 6	6 0	Memphis and Madison .....	8	
J. C. Atlee .....	88	3 6	6 0	do. ....	3	
J. D. Butts .....	12	2 6	2 0	Helena and Marianna .....	52	400
Hazel Rice .....	138	3 6	4 0	Helena and Bay Landing .....	2	
Maude Kilgore .....	82			Helena and Madison .....	1	
Rock City .....	53	2 6	5 0	Helena and Wittsburg and points } below Wittsburg.	(?)	
G. M. Sivley .....	98	3 6	5 6	Towing saw logs .....		

*Classification of commerce reported year ending May 31, 1903.*

Articles.	Tons.	Articles.	Tons.
Cotton .....	375	Grain .....	201
Cotton seed .....	1,250	Miscellaneous .....	232
Lumber .....	255		
Provisions .....	200	Total tonnage .....	88,035
Saw logs .....	85,522		

Estimated value, \$294,495.

## Y 8.

### IMPROVEMENT OF ST. FRANCIS RIVER, MISSOURI.

*Operations this fiscal year.*—The act of June 13, 1902, revived this improvement, which had been abandoned since fiscal year 1897. The Government owned no plant for this work, so effort was made to hire a barge upon which a hoisting apparatus and quarters for the working force could be placed, but none could be obtained. Therefore a barge, 20 by 60 by 3 feet, was built at Fisk, Mo., in August and September. Quarters and hoisting outfit were placed on it and snagging operations begun October 17. No work had been done in that section of the stream, i. e., above Big Drift, since the calendar year 1889, and it was in bad condition, so much so that although the barge removed only such obstructions as barred her passage down the river, 342 snags

were removed, 8 drifts broken and 480 trees cut in the first 4 miles below Fisk. The rate of progress being slow, the chopping party that had been employed on Cache River was sent to St. Francis as soon as the Cache River appropriation was expended. This party began operations 2 miles below St. Francis town November 1, and worked from there upstream. High water began to interfere with this work late in November and about the middle of December caused suspension of the work, the snagging barge quitting on December 13, and the chopping party on the 16th, excepting a few men that worked at the drift at Beasley Cut-off until the 31st of the month. The barge and the chopping party outfit were consolidated into one fleet and laid up for the winter at Big Drift December 21. Operations were resumed at Big Drift May 14. After opening a passable channel through this the work was carried upstream to the point where the barge suspended operations in December, 4 miles below Fisk. From this place the parties worked back downstream widening the cleared channel and at the close of the year were at Barnes shoal, 14 miles above St. Francis town.

The results of these operations are 886 snags removed, 1,803 trees cut, 148 drift piles broken up, 505 trees deadened, overhanging limbs cut off of 1,163 trees, and 1,356 sunken and abandoned saw logs cut into short lengths.

This stream is narrow, crooked, and, during low-water season, shallow. Its banks are generally low, subject to annual overflow and lined with leaning timber. The bed of the river is filled with fallen trees, sunken logs, and accumulations of drift. The water surface is frequently spanned with fallen trees that reach from bank to bank. The stream carries large quantities of drift which lodges against these trees or catches in the sharp bends, making large drift jams. These conditions make the progress of clearing the stream very slow and unsatisfactory. In the operations last fall the chopping party worked from December 7 to 14, both dates inclusive, opening a channel through a drift at Beasley Cut-off. The river began rising the next day, and within eight days thereafter drift again accumulated to such an extent that the river was blocked for a distance of 500 yards. A force of men were put to work there on the 23d of the month and worked there until the 31st, when the channel was again cleared. The drift thus loosened floated down the river to the railway bridge at St. Francis town, where it again jammed, making it necessary for the railway company to keep men at the bridge to break up the drift jams as they formed and to pass the drift through the bridge. Passing on down the river the drift lodged on older accumulations, increasing their size until the river is blocked again. A channel has been opened through the Big Drift, some 39 miles above St. Francis town, several times, but has never remained open for any length of time. In the vicinity of Seven-mile Island the same condition exists. The rapidity with which drift accumulated last fall, together with the naturally bad condition of the river when operations were begun, make it very doubtful indeed if the present appropriation will be sufficient to open a satisfactory channel for even medium stage navigation, much less so for ordinary low-water business. At any rate the work would have to be repeated every year if the improvement is to be maintained, and the amount of it required would not be much less than that done this year for many years to come. The present appropriation is based upon a report and estimate



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given in House Document No. 82, Fifty-fourth Congress, second session. When that report was made \$20,500 had been expended on the stream. At least \$12,000 of that amount was expended in the improvement from Brown's ferry (10 miles below St. Francis) to head of Big Drift (39 miles above St. Francis). When work was commenced last fall the river was in as bad condition as when the work on the original project, that of August 11, 1888, was begun, and I do not know of any reason why it would not take as much money to clear the river again as it did the first time. It is my opinion that the appropriation for this stream, if any satisfactory results are to be obtained from the work, should be \$30,000, that amount to be expended at the rate of \$5,000 a year for six years. It is my opinion that neither the present nor the prospective commerce justifies this, and I therefore make no estimate for the fiscal year ending June 30, 1905.

*Money statement.*

July 1, 1902, balance unexpended .....	\$10, 000. 00
June 30, 1903, amount expended during fiscal year .....	6, 323. 64
July 1, 1903, balance unexpended .....	3, 676. 36
July 1, 1903, outstanding liabilities .....	775. 26
July 1, 1903, balance available .....	2, 901. 10
Amount (estimated) required for completion of existing project .....	1, 200. 00

APPROPRIATIONS.

This reach of river is understood not to have been included in the snagging operations under the early appropriations for snagging in Western rivers. Its specific appropriations are as follows:

August 11, 1888 .....	\$5, 000. 00
September 19, 1890 .....	10, 500. 00
August 18, 1894 .....	5, 000. 00
June 13, 1902 .....	10, 000. 00
Total .....	30, 500. 00
Expended to June 30, 1903 .....	26, 823. 64
Unexpended July 1, 1903 .....	3, 676. 36

COMMERCIAL STATISTICS.

There are no boats on this stream. Report has been received that a gasoline boat 50 feet long, 15 feet wide, and 3 feet deep is now building at St. Francis. The commerce this year was 5,022 tons of saw logs and piling, having an estimated value of \$12,880.

## APPENDIX Z.

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REMOVING SNAGS AND WRECKS FROM MISSISSIPPI RIVER; IMPROVEMENT OF MISSISSIPPI RIVER BETWEEN OHIO AND MISSOURI RIVERS; AND IMPROVEMENT TO PREVENT THE MISSISSIPPI FROM BREAKING INTO CACHE RIVER AT BEECHBRIDGE, ABOVE CAIRO, ILLINOIS.

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REPORT OF MAJ. THOS. L. CASEY, CORPS OF ENGINEERS, OFFICER IN CHARGE, FOR THE FISCAL YEAR ENDING JUNE 30, 1903, WITH OTHER DOCUMENTS RELATING TO THE WORKS.

### IMPROVEMENTS.

- |  |   |
|--|---|
| 1. Removing snags and wrecks from the Mississippi River below the mouth of the Missouri River. | 3. To prevent the Mississippi River from breaking through into the Cache River at or near a point known as Beechridge, above Cairo, Illinois. |
| 2. Mississippi River between the Ohio and Missouri rivers.                                     |   |

### HARBOR LINES.

4. Mississippi River at and near St. Louis, Missouri.
- 

ENGINEER OFFICE, UNITED STATES ARMY,  
*St. Louis, Mo., July 16, 1903.*

GENERAL: I have the honor to transmit herewith the annual report for the works under my charge for the fiscal year ending June 30, 1903.

Very respectfully, your obedient servant,

THOS. L. CASEY,  
*Major, Corps of Engineers.*

Brig. Gen. G. L. GILLESPIE,  
*Chief of Engineers, U. S. A.*

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### Z 1.

REMOVING SNAGS AND WRECKS FROM THE MISSISSIPPI RIVER BELOW THE MOUTH OF THE MISSOURI RIVER.

A concise statement of the project for and history of this work will be found in the Annual Report of the Chief of Engineers, United States Army, to which this report is an appendix, as well as on page 2621 of the Report of the Chief of Engineers, United States Army, for 1900.

This work is now being done through the instrumentality of two large steel-hulled snag boats, *H. G. Wright* and *J. N. Macomb*, fitted

with all necessary tools and appliances and operated by hired men; they patrol the river between the mouth of the Missouri River and Natchez, Miss., with an occasional visit as far down as New Orleans, La.

#### OPERATIONS DURING THE FISCAL YEAR ENDING JUNE 30, 1903.

At the beginning of the fiscal year the snag boats were at St. Louis, Mo., for the purpose of receiving the ice and refrigerating plants to be installed thereon by the New Jersey Foundry and Machine Company, of New York, N. Y., under contract dated May 10, 1902, and for such minor repairs as were required.

The contractors were very dilatory in installing the plants, the work on the *Macomb* being completed at Cairo, Ill., on December 21, 1902, to which place she was ordered December 13 to avoid detention by ice and freezing weather north of that point.

The work on the *Wright* was completed at Memphis, Tenn., January 11, 1903, on her return from the patrol of the river as far south as Natchez, Miss.

The plants erected on these boats are modern and excellent, furnishing an abundance of ice and refrigeration, and the expenditure therefor has been found to be an economical and judicious investment in the saving of ice and prevention of deterioration of subsistence supplies.

During periods of delay in installing the plants and when the work of the boats was called for or required in the interests of navigation, they patrolled the river, and upon completion of the plants resumed their duties regularly and were in operation until the spring rise of the river, when they were laid up with reduced crews at St. Louis, about the middle of March, 1903. The high stage of the river that prevailed thereafter being unfavorable for removing snags and obstructions, the boats remained at St. Louis until the end of the fiscal year.

Capt. Alexander H. Stewart, who had been employed in this district since 1882 as master and pilot, and since 1889 as master of the snag boat *Macomb*, died at St. Louis, Mo., on April 25, 1903. During that period of twenty-one years' service in connection with the work of improvement and on the snag boat his services were faithful and efficient.

A summary of the work accomplished by the two boats during the fiscal year is found in the following table:

Name.	Snags pulled.	Trees cut.	Drift piles removed.	Miles run.
J. N. Macomb .....	680	5, 132	1	5, 201
H. G. Wright .....	872	1, 763	1	5, 124
Total .....	1, 552	6, 895	2	10, 325

In addition to the above the *Wright* removed the wreck of the steamer *Eagle*, near the Merchants Bridge, in the harbor of St. Louis, December 3-5, 1902.

The trees referred to are generally leaning timber in bends of the river or trees that are liable to fall into the water and become obstructions to navigation.

An annual appropriation of an amount not to exceed \$100,000 having been made for this work, the snag boats will patrol the river whenever necessary, in order to keep the channel free from obstructions, such as logs, drift piles, leaning trees, and such wrecks as they may be able with their appliances to remove after the same have been blown to pieces with explosives.

## EXPENDITURES.

The amount expended on this work to July 1, 1902, under all specific appropriations since and to include March, 1879, is \$1,726,889.86.

Amount expended from current allotment during the fiscal year, \$72,587.48. A statement of this expenditure, as required by law, is given in the accompanying table.

The work done by the snag boats is of great benefit to the commerce and navigation on the river. Before the river was so completely patrolled as it now is, the sinking of steamboats and other craft by running on snags was a common occurrence. During recent years such disasters seldom occur. Although life and property would seem to be much safer now than formerly, the rate of insurance has not materially decreased.

It is proposed during the coming year to continue operating these snag boats, as provided in the river and harbor act of August 11, 1888.

The statistics relating to the commerce benefited by the operation of these snag boats will be found in the report of operations for this year for the improvement of the Mississippi River from the mouth of the Missouri to the mouth of the Ohio River.

The headquarters of the snag boats is in St. Louis.

The amount of customs collected at St. Louis during the fiscal year was \$2,035,054.62.

The amount of internal revenue collected was \$7,970,623.27.

*Money statement.*

Amount drawn under section 7, act of August 11, 1888.....	\$72, 587. 48
June 30, 1903, amount expended during fiscal year .....	72, 587. 48
July 1, 1903, amount available for fiscal year 1903-4 .....	100, 000. 00

## APPROPRIATIONS.

By act of—		Fiscal year ending June 30—	
March 3, 1879.....	\$100, 000. 00	1894.....	\$88, 252. 46
June 14, 1880.....	100, 000. 00	1895.....	100, 000. 00
March 3, 1881.....	80, 000. 00	1896.....	80, 496. 26
March 2, 1882.....	85, 000. 00	1897.....	83, 421. 64
July 5, 1884.....	72, 950. 63	1898.....	88, 917. 74
August 5, 1886.....	56, 250. 00	1899.....	88, 923. 15
August 11, 1888.....	100, 000. 00	1900.....	86, 355. 29
Fiscal year ending June 30—		1901.....	86, 710. 05
1890.....	49, 089. 17	1902.....	<sup>a</sup> 93, 055. 27
1891.....	92, 720. 97	1903.....	72, 587. 48
1892.....	98, 250. 00		
1893.....	96, 497. 23	Total .....	1, 799, 477. 34

<sup>a</sup> \$415.60 in excess of amount stated in report for fiscal year ending June 30, 1902, on account of additional payments on ice plants.

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TABLE NO. 1.—Summary of expenses for operating U. S. snag boats H. G. Wright and J. N. Macomb in connection with the work of removing obstructions in Mississippi River during the fiscal year ending June 30, 1903.

Application.	1902.				
	July.	August.	September.	October.	November.
Office expenses.....		\$6.34	\$987.80	\$279.16	\$2.96
Expenses of snag boat H. G. Wright:					
Crew.....	\$1,425.00		3,778.96	1,432.50	1,438.33
Outfit.....		18.50		78.00	16.50
Fuel.....	96.00	170.00	960.00	144.25	548.37
Subsistence.....	48.62	675.18	434.00	62.43	
Supplies.....		208.80		7.65	
Repairs.....	20.00	27.00	56.25	2.80	6.46
Miscellaneous.....		12.38	7.90		
Expenses of snag boat J. N. Macomb:					
Crew.....	1,285.67		3,002.17	1,980.49	1,562.33
Outfit.....					30.00
Fuel.....	238.36			1,129.75	276.08
Subsistence.....	48.64	398.46	111.51	831.70	
Supplies.....			14.49	3.65	
Repairs.....	139.69	51.14	7.91	1.30	40.58
Miscellaneous.....		12.37			
Total.....	3,301.98	1,580.17	9,360.99	5,903.68	3,911.60

Application.	1902.	1903.			
	December.	January.	February.	March.	April.
Office expenses.....	\$1,014.70	\$3.20	\$998.20	\$187.79	\$1,085.32
Expenses of snag boat H. G. Wright:					
Crew.....	2,141.00	2,135.00	2,147.00	2,014.75	1,461.00
Outfit.....	58.75	101.99			11.00
Fuel.....	539.88	1,180.00	729.00	588.25	59.27
Subsistence.....	416.82	681.95	174.90	172.27	98.86
Supplies.....	132.76	85.65		126.00	9.85
Repairs.....	83.00		3.69		74.00
Miscellaneous.....					
Expenses of snag boat J. N. Macomb:					
Crew.....	1,909.00	2,093.00	2,100.68	2,007.88	1,402.67
Outfit.....	50.00	102.00			
Fuel.....	270.40	1,244.00	740.00	819.00	592.00
Subsistence.....	1,096.69	452.84	341.06	22.55	229.00
Supplies.....		85.64			9.85
Repairs.....	108.25	111.48			
Miscellaneous.....					
Total.....	7,826.25	8,276.75	7,234.53	5,937.44	5,032.82

Application.	1903.		Total.
	May.	June.	
Office expenses.....	\$1.50		\$4,566.96
Expenses of snag boat H. G. Wright:			
Crew.....	1,422.16	\$1,515.67	20,911.37
Outfit.....	878.61	37.92	1,201.27
Fuel.....	156.90	190.00	5,361.92
Subsistence.....	375.02	438.51	3,578.56
Supplies.....	489.40	42.99	1,102.10
Repairs.....	1,164.92	369.90	1,408.02
Miscellaneous.....		12.50	32.78
Expenses of snag boat J. N. Macomb:			
Crew.....	1,360.17	1,550.00	20,194.01
Outfit.....	404.40	102.50	694.90
Fuel.....	268.75	331.24	5,909.58
Subsistence.....	290.44	332.44	4,155.33
Supplies.....	230.79	.75	345.17
Repairs.....	1,878.70	362.59	2,696.64
Miscellaneous.....		12.50	24.87
Total.....	8,921.76	5,299.51	72,587.48

## Z 2.

## IMPROVEMENT OF MISSISSIPPI RIVER BETWEEN OHIO AND MISSOURI RIVERS.

A concise statement of the project for and history of this work will be found in the Annual Report of the Chief of Engineers for 1903, page 390, as well as on page 2631 of the Report of the Chief of Engineers, United States Army, for 1900.

Reference should be made to the Report of the Chief of Engineers, United States Army, for 1894, pages 1577 et seq., for information relating to the development of the various forms of construction and for a résumé of the various types employed between 1872 and 1894, and to the Reports of the Chief of Engineers, United States Army, for 1895 (p. 2059), 1896 (p. 1717), 1897 (p. 2012), 1898 (p. 1698), 1900 (p. 2632), and 1901 (p. 2169) for minor details as to forms of construction.

Since the adoption of this project work has been done substantially according to the methods referred to above at the following localities: Mouth Missouri River, St. Louis Harbor, Cahokia Chute, Arsenal Island, Horsetail bar, Carroll Island, Twin Hollows, Pulltight, Beards Island, Chesley Island, Jim Smiths, Sulphur Springs, Foster Island, Lucas, Cornice Island, Rush Tower, Michaels Landing, Danby Landing, Rush Towhead, Penitentiary Point, Turkey Island, Ste. Genevieve, Kaskaskia Island, Chester, Liberty Island, Seventy-six Landing, Hamburg, Devils Island, Minton Point, Cape Girardeau, Commerce Island, Burnham Island, Powers Island, Goose Island, Buffalo Island, Greenleaf Bend, and vicinity of Cairo.

During the fiscal year ending June 30, 1903, work for the permanent improvement of the river has been carried on, as hereinafter described, at the following localities: Lucas, Rush Tower, Danby Landing, Rush Towhead, Turkey Island, Ste. Genevieve, Mo., Chester, Liberty Island, Greenleaf Bend, and Cairo Protection.

## PERMANENT IMPROVEMENT.

*Lucas Hurdles (29 miles below St. Louis).*—A summary of the operations at this point will be found on page 2633 of the Report of the Chief of Engineers for 1900.

For the further improvement of this reach four additional hurdles were built during the year: No. 1, on the Missouri side in front of Herculanum, Mo., about 300 feet above the mouth of Joachim Creek; Nos. 16½, 18, and 19½ on the Illinois side. For location, reference should be made to Plate I. The total construction amounted to 4,500 linear feet of hurdles.

A good depth was maintained in the channel during the year.

*Rush Tower, Illinois (37 miles below St. Louis).*—The Illinois shore between Osborne Field and Kempers Landing was protected for 8,770 feet during 1892, 1893, and 1894. The protection was extended 3,030 feet further downstream in 1901, with subaqueous mattress and revetment up to the foot of the bluff bank, to an average stage of 16 feet above the low water of 1863.

The bank above the protection having been graded by the river, the revetment was repaired and was carried up to an average stage of 25 feet above the low water of 1863.

The total amount of revetment placed was 3,730 linear, or 116,700 square feet.

*Danby Landing, Missouri (40 miles below St. Louis).*—The protection at this locality was begun in 1895. The mattress had been placed for 5,450 linear feet, and all except 700 feet at the upper end was revetted to stages of from 16 to 20 feet.

During the fiscal year 1903 the old work was repaired and all the revetment raised to a height of 26 feet above the low water of 1863; as high as the bank had been graded.

The total amount of bank covered was 5,400 linear, or 118,100 square feet.

*Rush Torhead, Illinois (42 miles below St. Louis).*—The protection, 2,435 feet long, built in 1901, was carried up to a 13-foot stage. It was extended 100 feet farther upstream, and all, except 700 feet, made inaccessible to barges by a bar which formed in its front, was carried to the top of the graded bank at a 27-foot stage during 1903. The total amount of revetment placed was 1,835 linear, or 61,200 square feet.

*Turkey Island, Illinois (52 miles below St. Louis).*—The protection of the west shore of the island was begun in 1895, when a mattress was built for 5,250 feet and revetment begun. The stonework was repaired in 1898 and carried to stages of from 10 to 15 feet.

Work for the extension of this protection to higher planes was begun at this place November 30, 1902, and 1,600 feet of revetment near the lower end was raised to a 24-foot stage, in which a total of 59,600 square feet of revetment was placed.

*Ste. Genevieve, Mo. (60 miles below St. Louis).*—A summary of the operations at this point will be found on page 2170 of the Report of the Chief of Engineers for 1901.

The revetment was raised from a 20-foot stage to a 28-foot stage for 450 linear feet below hurdle No. 18, in which 5,400 square feet of revetment was placed. Work was suspended on account of the high water of June.

*Chester, Mo. (Horse Island and Claryville, 74 miles below St. Louis).*—The bank of Horse Island was protected for a distance of 4,058 feet during 1899. The revetment was repaired and extended up to an average stage of 20 feet during 1900 and 1901. The work of 1903 was in repair and extension downstream and to higher planes.

The upper portion of the bank inside the protection had been cut away by high water, allowing a large body of water to run down inside the mattress. The bank was eroded for about 1,400 feet, with a maximum recession of 75 feet, beginning 2,600 feet below the head of the old protection.

A mattress varying in width from 60 feet to 130 feet was built to protect the bank inside the old mattress from station 26 to a point 288 feet below the foot of the old work. At two places where the erosion had been greatest a single line of piles was driven to a distance of 60 feet from shore. The old revetment was repaired, and portions raised to a stage of 30 feet above the low water of 1863.

Work was suspended about the end of May on account of high water. Considerable erosion occurred during June between stations 17 and 26.

A total of 1,746 linear, or 166,230 square feet of mattress was built and sunk and 1,950 linear, or 23,735 square feet of revetment placed.

*Liberty, Mo. (82 miles below St. Louis).*—The protection between Anchor Landing and Bishops Landing was built in 1877. It was partly rebuilt in 1895 and was then completed up to a 12-foot stage.

It was repaired in 1900 and a part of the bank revetted up to 21 feet above the zero of the St. Louis gauge.

No work could be done the following year on account of the failure of appropriations, and the bank was cut away inside the protection, the maximum recession being about 400 feet.

To prevent further damage, and to restore the shore line to the old protection, eight short hurdles were begun between the foot of Cranes Island and the foot of the old mattress during the spring of 1903. These hurdles are numbered 1½, 6½, 8, 9, 10, 11, 12, and 13, the number showing their distance in thousands of feet below Cranes Island. They will have an aggregate length of about 2,000 feet, and were built to a stage of about 30 feet at the shore end. The outer ends will be about 15 feet lower when completed, but their construction was suspended on account of the high water of June.

The equivalent of about 1,500 linear feet of completed hurdle was built during the year.

*Liberty, Ill. (85 miles below St. Louis).*—A summary of the operations at this point will be found on page 2171 of the Report of the Chief of the Engineers for 1901.

The revetment was repaired and raised to an average stage of 25 feet from station 31 to station 80, and to 22 feet from station 80 to station 108, during the fall season of 1903.

A total of 6,610 linear, or 176,400 square feet of revetment was placed.

*Greenleaf Bend, Illinois (167 miles below St. Louis).*—The protection of the soft and rapidly caving bank in this bend was begun during the first half of the fiscal year 1903.

The mattress was built and the bank revetted up as far as graded, or to an average stage of 18 feet, for a distance of 6,075 feet, in which 891,725 square feet of mattress was woven and sunk and 138,840 square feet of revetment placed.

*Cairo protection, Illinois (178 miles below St. Louis).*—For description of this work, see Reports of the Chief of Engineers from 1877 to 1881, and for 1885, 1887, 1891, and 1899.

A break made in the revetment between the two upper spur dikes by the high water of 1902 was repaired this year by 290 linear, or 11,310 square feet of revetment and a short spur dike. This work exhausted the balance of the appropriation of 1884, amounting to \$2,571.70.

#### TEMPORARY EXPEDIENTS.

*Dredging.*—The past year has been remarkable for the high stages prevailing during the season of navigation. The minimum gauge reading was 7.5 feet on September 24, after which it rose and varied from 9 feet to 21 feet during the remainder of the fall season. These high stages rendered but little dredging necessary. The dredges were kept in commission, however, from the beginning of the low-water season until the end of November, and worked for short periods at Crystal City, Ste. Genevieve Bend, and Philadelphia Point in each case until their use was made unnecessary by high water.

#### PLANT.

The plant belonging to this improvement deteriorated while idle on account of the exhaustion of available funds during the preceding year.



Repairs begun in August and prosecuted vigorously throughout the fiscal year restored to a serviceable condition sufficient of the plant to supply urgent needs.

The steamer *Gen. T. L. Casey* was docked and extensively repaired at the Carondelet ways of the Wiggins Ferry Company in the fall and the steamer *Gen. H. L. Abbot* in the spring.

Six barges, one quarter boat, one office and survey boat, and seven pile drivers were extensively repaired on the ways at the engineer depot during the year, a store boat was equipped for carrying ice and provisions to working parties in the field, and the construction of eight steel flats, each 16 feet by 55 feet, for which material was bought in 1901, was nearly completed.

The current repairs needed to maintain the plant in an efficient working condition were made as required.

#### MATERIAL.

The piles, lumber, and part of the stone required for the construction works were procured by contract; the remainder of the stone was procured by hired labor and payment of royalty at Little Rock quarries, near Ste. Genevieve, Mo. No bids having been received in the autumn, all the stone used during that season was procured at those quarries, but contracts were made in the spring and 2,407 cubic yards were purchased under them.

#### ORGANIZATION.

The organization remained substantially the same as last year (see pages 1598 and 1599 of Report of Chief of Engineers for 1902), with the exception of the loss incurred by the death of Assistant Engineer E. D. Libby, which occurred at Concord, N. H., April 24, 1903.

Mr. Libby was born in Maine in 1852, graduated from Dartmouth College in 1879 and from Thayer School with degree of civil engineer in 1882, and was appointed assistant resident engineer and served as such until 1887, when he severed his connection at his own request to accept a position with an iron works at Wilmington, Del., whence he went to Providence, R. I., with the Boston and Providence Railroad, returning to this office as assistant engineer, where he was actively engaged until the winter of 1901-2, when, on account of failing health, he was given a furlough without pay.

Mr. Libby filled every position which he held under this office with entire satisfaction to the officer in charge and with credit to himself. His ability as a civil engineer, which he brought to bear upon all his work with untiring industry, was of high order.

#### ESTIMATES.

The original estimate of the cost of the improvement of the Mississippi River between the mouths of the Ohio and Missouri rivers, as revised in 1883, is \$16,397,500.

The total appropriations to date amount to \$11,104,999.98. Of this amount \$180,000 was allotted by acts and projects for improvement between the Illinois and Missouri rivers, including Alton Harbor, leaving a balance of \$10,924,999.98 to be applied to the project for the

general improvement between the mouths of the Ohio and Missouri rivers. The balance of the estimate for the original project for the general improvement between the Ohio and Missouri rivers not appropriated June 30, 1903, is, therefore, \$5,472,500.02.

The amount that has been expended upon the project to this date is \$10,037,957.77.

The balance available June 30, 1903, of the amount appropriated is \$887,042.21, to which must be added \$97.81 received on account of rental of pile drivers under authority of the Secretary of War, and \$2,386.09 received from sale of condemned property, a total of \$889,526.11, exclusive of outstanding liabilities.

The amount expended during the fiscal year was \$496,589.04, of which \$496,524.12 was by voucher and \$64.92 by Auditor for the War Department.

The river and harbor act approved June 3, 1896, provides—

That any balance of former appropriations now available, and the money hereby appropriated and authorized to be expended for the said section of said river between the mouth of the Missouri River and the mouth of the Ohio River, or so much thereof as may be necessary, shall be expended in the construction of suitable dredge boats, portable jetties, and other suitable appliances, and in the maintenance and operation of the same, with the view of ultimately obtaining and maintaining a navigable channel from St. Louis to Cairo not less than two hundred and fifty feet in width and nine feet in depth at all periods of the year, except when navigation is closed by ice.

In the \$10,037,957.77 above mentioned is included what has been expended for dredge plants, portable jetties, and appliances for temporary improvement of the channel and for operating the same. This amounts to about \$627,425.85. Of this, \$48,151.76 was expended during the fiscal year for operating dredges and minor repairs of same. The approximate value of this plant at the beginning of the fiscal year was \$209,425.81. Its present approximate value is \$194,677.10.

The available balance includes the unexpended balances from special allotments made by Congress, as follows:

For revetting bank opposite mouth of Missouri River, act of March 3, 1899.	\$30, 772. 84
For protection of bank on Missouri side and to deepen and straighten channel at Wittenberg, Mo., act of March 3, 1899 .....	10, 000. 00
Total .....	40, 772. 84

#### PHYSICAL DATA.

*Gauges.*—The gauges on this part of the river have been read and repaired as required.

*Discharge measurements.*—Measurements for the discharge of the river were made with full-depth rod floats at the engineer depot. Measurements with two Haskell meters were made by the Mississippi River Commission, on July 18 and 19, in the same cross section as that used by the floats and at the same stations. One meter was in bad order, but the other gave velocities and discharge that agreed very closely with the results from the floats. The curves of velocity and discharge have been determined between a 5-foot and a 15-foot stage, but more observations are needed for higher and lower stages.

Measurements were also made at Chester, Ill., to determine the discharge of the flood of June, in which a maximum of 900,000 cubic feet per second was obtained, with surface velocities in midstream of 8 miles per hour.

## 1450 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

## SURVEYS.

A survey was made of the river from the mouth of the Missouri River to the River Des Peres, from which a system of harbor lines for the city of St. Louis and confronting towns on the Mississippi River was prepared by me and submitted for approval with letter dated March 6, 1903. The lines were approved by the Secretary of War April 6, 1903.

\* \* \* \* \*

*Money statement.*

July 1, 1902, balance unexpended .....	\$733, 729. 06
November 25, 1902, received from sale of condemned property .....	2, 386. 09
Amount appropriated by sundry civil act approved March 3, 1903 .....	650, 000. 00
	<hr/>
	1, 386, 115. 15
June 30, 1903, amount expended during fiscal year .....	496, 589. 04
	<hr/>
July 1, 1903, balance unexpended .....	889, 526. 11
July 1, 1903, outstanding liabilities .....	8, 749. 90
	<hr/>
July 1, 1903, balance available .....	<sup>a</sup> 880, 776. 21
	<hr/>
July 1, 1903, amount covered by uncompleted contracts .....	107, 228. 71
	<hr/>
Amount (estimated) required for completion of existing project .....	5, 472, 500. 02
Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903:	
For works of improvement .....	\$850, 000. 00
For maintenance of improvement .....	150, 000. 00
	<hr/>
	1, 000, 000. 00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

## LIST OF APPROPRIATIONS.

By act of—		By act of—	
June 10, 1872 .....	\$100, 000. 00	March 3, 1893 .....	\$658, 333. 33
March 3, 1873 .....	200, 000. 00	August 18, 1894 .....	758, 333. 33
June 23, 1874 .....	200, 000. 00	March 2, 1895 .....	758, 333. 33
March 3, 1875 .....	200, 000. 00	June 3, 1896 .....	275, 000. 00
August 14, 1876 .....	200, 000. 00	June 4, 1897 .....	673, 333. 33
June 18, 1878 .....	240, 000. 00	July 19, 1897 .....	325, 000. 00
March 3, 1879 .....	200, 000. 00	July 1, 1898 .....	673, 333. 33
June 14, 1880 .....	250, 000. 00	March 3, 1899 .....	673, 333. 33
March 3, 1881 .....	600, 000. 00	June 6, 1900 .....	100, 000. 00
August 2, 1882 .....	600, 000. 00	June 13, 1902 .....	650, 000. 00
July 5, 1884 .....	520, 000. 00	March 3, 1903 .....	650, 000. 00
August 5, 1886 .....	375, 000. 00	Other receipts .....	2, 483. 90
August 11, 1888 .....	300, 000. 00		
September 19, 1890 .....	400, 000. 00		
July 13, 1892 .....	525, 000. 00	Total .....	11, 107, 483. 88

<sup>a</sup> Distributed under subheadings as follows:

For revetting bank opposite mouth of Missouri River, act of March 3, 1899 .....	\$30, 772. 84
For from mouth of Ohio River to mouth of Missouri River, acts of June 13, 1902, and March 3, 1903 .....	818, 293. 41
For protection of bank on Missouri side and to deepen and straighten channel at Wittenberg, Mo., act of March 3, 1899 .....	10, 000. 00
For allotment for Sawyers Bend, act of June 13, 1902 .....	21, 709. 96
	<hr/>
Total .....	880, 726. 21

## LIST OF EMERGENCY CONTRACTS IN FORCE JUNE 30, 1903.

Name and article.	Rate.	Date of contract.	Date of beginning.	Date of expiration.
M. E. Leming, Cape Girardeau, Mo.: 2,500,000 feet mattress lumber .....	\$16.90 per M .....	1903. Mar. 21	1903. Apr. 5	1903. Dec. 5
Clay City Manufacturing Co., Clay City, Ind.: 500,000 feet mattress lumber .....	\$12 per M .....	Mar. 30	Apr. 14	Dec. 14
Frederick Hartweg, Cincinnati, Ohio: 1,500 first-class piles .....	14½ cts. per lin. foot ...	Apr. 4	Apr. 19	Dec. 19
3,000 second-class piles .....	11 cts. per lin. foot ...			
H. W. Bussen, Oakville, Mo.: 5,000 cubic yards stone .....	55 cts. per cub. yard ..	Apr. 6	Apr. 21	Dec. 21
Albert Bussen, Quarantine, Mo.: 5,000 cubic yards stone .....	55 cts. per cub. yard ..	Apr. 8	Apr. 23	Dec. 23
C. F. Liebke Hardwood Mill and Lumber Co., St. Louis, Mo.: 72,000 feet oak lumber .....	\$52.50 per M .....	Apr. 8	Apr. 9	Dec. 9
Grafton Quarry Co., Grafton, Ill.: 15,000 cubic yards stone .....	60 cts. per cub. yard ..	Apr. 10	Apr. 25	Dec. 25
5,000 cubic yards spalls .....				
K. H. Killebrew & Co., Cape Girardeau, Mo.: 60,000 cubic yards stone .....	50 cts. per cub. yard ..	Apr. 11	Apr. 26	Dec. 26
15,000 cubic yards spalls .....				

## COMMERCIAL STATISTICS.

*Receipts and shipments at St. Louis, Mo., during the year 1902.*

Receipts:	Tons.
Barbed wire, ores, and metals (pig and manufactured) .....	1, 210
Coal and coke .....	
Cotton and cotton products .....	1, 321
Groceries and dairy products .....	11, 765
Hay, seed, grain, flour, meal, etc. ....	76, 677
Live stock and products .....	20, 967
Lumber .....	31, 369
Merchandise and sundries .....	264, 410
Vegetables and fruits .....	8, 989
White lead, oils, etc. ....	34
Wines and liquors .....	5
Wool .....	173
<b>Total .....</b>	<b>416, 920</b>
<b>Shipments:</b>	
Barbed wire, ores, and metals (pig and manufactured) .....	2, 125
Coal and coke .....	11, 465
Cotton and cotton products .....	359
Groceries and dairy products .....	7, 462
Hay, seed, grain, flour, meal, etc. ....	102, 369
Live stock and products .....	5, 879
Lumber .....	3, 129
Merchandise and sundries .....	82, 186
Vegetables and fruits .....	2, 198
White lead, oils, etc. ....	893
Wines and liquors .....	6, 195
Wool .....	2
<b>Total .....</b>	<b>224, 262</b>

*Transferred by ferries across the river at St. Louis.*

	Tons.
1899 .....	5, 036, 730
1900 .....	5, 218, 967
1901 .....	5, 860, 592
1902 .....	5, 731, 635

Shipments of grain, including flour, meal, etc., and coal down the river from landings between St. Louis and Cairo, during the year 1902, amounted to 17,178 tons.

# 1452 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

*List of steam-power boats that arrived at St. Louis during the year 1902.*

Size of boats.	Draft.	Number.	Times arrived.
	<i>Fect.</i>		
Under 500 gross tons.....	2.5 to 6	108	1,543
Between 500 and 1,000 gross tons.....	4 to 7.6	4	353
Total.....		112	1,896

*List of barges and scows that arrived at St. Louis during the year 1902.*

Size of boats.	Draft.	Number.	Times arrived.
	<i>Fect.</i>		
Under 500 gross tons.....	2.5 to 7.5	203	383
Between 500 and 1,000 gross tons.....	5.2 to 8	14	29
Over 1,000 gross tons.....		2	4
Total.....		219	416

*Number of vessels and their tonnage permanently and temporarily enrolled and licensed at the port of St. Louis, Mo., December 31, 1902.*

	No. of vessels.	Gross tonnage.	Net tonnage.
Permanent enrolled wood steamers.....	81	25,620	23,121
Permanent enrolled iron and steel steamers.....	8	2,999	2,325
Permanent enrolled barges (wood).....	45	36,761	36,692
Permanent enrolled barges (steel).....	2	2,324	2,324
Permanent enrolled steam yachts (wood).....	2	112	62
Permanent enrolled steam yachts (steel).....	2	177	123
Permanent enrolled sailing yachts (wood).....	1	30	26
Permanent enrolled sailing yachts (steel).....	1	62	62
Temporary enrolled steamers (steel).....	1	1,079	1,079
Licensed steamers (wood).....	13	154	119
Licensed steamers (steel).....	1	26	13
Licensed barges.....	1	15	15
Licensed sailing yachts.....	1	9	8
Licensed steam yachts (wood).....	3	33	29
Total.....	162	69,401	65,998

*Total cost and work done to June 30, 1903.*

	Dikes and dams.		Hurdles.		
	Linear feet.	Cost.	New.	Repairs.	Cost.
Prior to July 1, 1902.....	39,367	\$814,358.33	<i>Lin. feet.</i> 346,630	<i>Lin. feet.</i> 82,065	\$5,594,099.74
During year ending June 30, 1903.....			9,443		137,722.24
Total.....	39,367	814,358.33	356,073	82,065	5,731,821.98

*Bank protection.*

	New.		Repairs.	Cost.
	<i>Lin. feet.</i>	<i>Square feet.</i>	<i>Lin. feet.</i>	
Prior to July 1, 1902.....	232,657	34,436,051	4,100	\$2,096,854.03
During year ending June 30, 1903.....	19,850	652,740	12,161	160,627.73
Total.....	252,507	34,988,791	16,261	2,257,481.76

*Total cost and work done to June 30, 1903—Continued.*

	Temporary expedients.		Surveys, gauges, etc.	
	Cost of jetties.	Cost of dredging.	Cost of surveys and gauges.	Cost of examinations.
Prior to July 1, 1902.....	\$114, 603. 53	\$246, 367. 13	\$203, 068. 23	\$12, 391. 96
During year ending June 30, 1903.....		48, 151. 76	11, 256. 57	
Total.....	114, 603. 53	294, 518. 89	214, 323. 80	12, 391. 96

*Recapitulation.*

Dikes and dams.....	\$814, 358. 33	
Hurdles.....	5, 731, 821. 98	
Protection.....	2, 257, 581. 76	
		\$8, 803, 762. 07
Jetties.....		114, 603. 53
Dredging.....		294, 518. 89
Surveys and gauges.....	214, 323. 80	
Examinations, etc.....	12, 391. 96	
		226, 715. 76
Total.....		9, 439, 600. 25

*Property account.*

Class.	Value July 1, 1902.	Debits.	Credits.	Value June 30, 1903.
Steamer Gen. T. L. Casey.....	\$9, 241. 60	\$22, 524. 01	\$18, 879. 83	\$12, 885. 78
Steamer Gen. H. L. Abbot.....	17, 382. 53	19, 852. 92	16, 675. 63	20, 559. 82
Steamer Wm. R. King.....	61, 867. 57	18, 018. 17	21, 669. 54	58, 216. 20
Dredge No. 1.....	8, 691. 27	133. 33	1, 348. 12	7, 436. 48
Dredge No. 2.....	11, 588. 36	76. 66	1, 719. 72	9, 915. 80
Dredge No. 3.....	91, 816. 38	9, 763. 11	15, 189. 46	86, 390. 03
Dredge No. 4.....	89, 797. 86	13, 744. 88	19, 051. 90	84, 490. 34
Steam tenders, wood.....	9, 270. 70	1, 890. 72	3, 182. 50	7, 968. 92
Steam tenders, steel.....	49, 998. 52	1, 780. 11	4, 735. 02	47, 043. 61
Barges, model.....	88, 121. 72	52, 633. 00	27, 462. 81	113, 291. 91
Store boat.....		2, 354. 89	176. 62	2, 178. 27
Quarter boats.....	18, 323. 50	11, 342. 81	8, 753. 11	20, 913. 20
Office and survey boats.....	5, 794. 18	4, 876. 52	2, 561. 64	8, 109. 06
Pile drivers.....	43, 381. 13	18, 508. 75	16, 281. 59	45, 603. 29
Derrick boats.....	2, 607. 38	480. 65	857. 09	2, 230. 94
Derricks.....	2, 897. 09		418. 26	2, 478. 83
Machine shops.....	1, 448. 54	2, 429. 78	2, 638. 91	1, 239. 41
Small boats.....	27, 008. 90	11, 380. 98	14, 680. 39	28, 709. 49
Steel flats.....		10, 233. 90		10, 233. 90
Portable quarters.....	1, 906. 64	727. 00	1, 002. 27	1, 631. 37
Jetty gates.....	7, 532. 44		1, 087. 49	6, 444. 96
Ways (engineer depot).....	3, 829. 09	642. 72	1, 195. 54	3, 276. 27
Wharf boat.....	146. 42	372. 92	519. 34	
Engineer depot.....	4, 055. 94	1, 247. 18	1, 832. 76	3, 470. 36
Tools and appliances.....	12, 009. 86	13, 384. 92	9, 849. 43	15, 545. 85
Boarding outfit.....	15, 648. 18	4, 165. 98	3, 664. 81	16, 149. 35
Office furniture.....	615. 67	80. 00	104. 35	591. 82
Survey instruments.....	1, 323. 70	246. 71	233. 93	1, 336. 48
Photographic apparatus.....	257. 14		257. 14	
Models.....		414. 00		414. 00
Total.....	586, 561. 81	223, 291. 62	196, 099. 20	613, 754. 23

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*Material account.*

Class.	Value July 1, 1902.	Debits.	Credits.	Value June 30, 1903.
Subsistence .....	\$222.25	\$39,926.25	\$36,965.50	\$3,183.00
Piles .....	5,704.15	20,024.37	22,364.83	3,363.69
Stone .....	1,399.05	91,360.28	90,213.55	2,545.78
Rope .....	16,491.29	14,076.06	5,681.39	24,885.96
Wire .....	330.02	4,269.15	2,804.11	1,795.06
Iron .....	7,147.53	2,590.65	6,699.65	3,038.53
Nails .....	344.15	1,531.65	996.35	879.45
Spikes .....	961.63	1,241.25	932.70	1,270.18
Lumber, miscellaneous .....	8,313.81	30,026.00	23,668.95	14,670.86
Lumber, mattress .....	435.33	28,322.95	28,758.28	.....
Oakum .....	243.25	1,877.50	1,789.51	\$81.24
Coal .....	1,074.49	29,501.51	28,875.16	1,700.84
Ice .....	.....	1,948.49	1,948.49	.....
Material, miscellaneous .....	10,717.77	29,900.02	22,528.45	18,089.34
Total .....	53,384.72	296,596.13	274,176.92	75,803.93

*Engineer office, U. S. A., in account with United States, from 1870 to June 30, 1903.*

To allotments, appropriations, etc., prior to July 1, 1902:

1872-1880. Allotments for surveys .....	\$51,208.77	
1876-1897. Special appropriations .....	401,600.00	
1879-1902. Miscellaneous receipts .....	2,210.98	
1872-1902. Appropriations, general improvement....	10,479,999.98	
		\$10,935,019.73

Mar. 3, 1903. Appropriation, Mississippi River between Ohio and Missouri rivers .....

650,000.00

To miscellaneous receipts deposited:

Nov. 25, 1902. Sale of condemned property .....	\$2,386.09	
Dec. 30, 1902. Overpayments, vouchers 189 and 190, November, 1902 .....	8.00	
Jan. 10, 1903. Overpayment, voucher 191, December, 1902 .....	21.33	
Jan. 27, 1903. Overpayment, voucher 193, December, 1902 .....	12.00	
June 6, 1903. Overpayment, voucher 32, June, 1903 .....	1.33	
		2,428.75

To nonpayments:

June 30, 1903. Unpaid percentage on annulled contract .....	900.17	
Unpaid percentage on contracts in force .....	2,240.22	
Unpaid labor .....	3,287.46	
Unpaid miscellaneous .....	8,944.42	
		15,372.27

Total .....

11,602,820.75

June 30, 1903. By construction between Illinois and

Missouri rivers:

Piasa Island dam .....	\$37,910.41	
Piasa Island dam, cutting channel .....	3,116.86	
Alton dam .....	33,740.05	
Alton dike .....	126,652.74	
		201,420.06

By construction between Ohio and Missouri rivers... 8,803,762.07

By jetties .....

114,603.53

By dredging .....

294,518.89

By surveys and gauges .....

226,715.76

By withdrawn for Office of Chief of Engineers .....

2,220.50

By loss account .....

380,495.67

By property on hand .....

613,754.23

By material on hand .....

75,803.93

By appropriations unexpended:

Mississippi River, Ohio to Missouri .....

889,526.11

Total .....

11,602,820.75

## Z 3.

TO PREVENT THE MISSISSIPPI RIVER FROM BREAKING THROUGH INTO THE CACHE RIVER AT OR NEAR A POINT KNOWN AS BEECH-RIDGE, A FEW MILES ABOVE CAIRO, ILLINOIS.

A concise statement of the history of this work, together with the approved project for the expenditure of the appropriation of June 4, 1897, and the resulting operations to June 30, 1901, will be found in the Annual Report of the Chief of Engineers for 1901.

At the beginning of the fiscal year 1903 the revetment had been broken in a number of places by slides in the bank, and its head was considerably damaged, all of which was repaired. The work is now in good condition up to a 33-foot stage for the upper 5,000 feet and to an average stage of 24 feet for 4,000 feet more, the lower 435 feet having been practically destroyed.

A total of 2,265 linear, or 55,125 square, feet of revetment was placed during the year.

No further appropriation is asked for this work.

*Money statement.*

July 1, 1902, balance unexpended .....	\$6, 430. 56
June 30, 1903, amount expended during fiscal year .....	6, 430. 56

## Z 4.

ESTABLISHMENT OF HARBOR LINES ALONG THE MISSISSIPPI RIVER AT AND NEAR ST. LOUIS, MISSOURI.

ENGINEER OFFICE, UNITED STATES ARMY,  
*St. Louis, Mo., March 6, 1903.*

**GENERAL:** In conformity with sixth indorsement Chief of Engineers, U. S. Army, on letter of Julius Pitzman, St. Louis, Mo., July 18, 1902, I have the honor to state that after advertisement in the St. Louis papers a hearing was held in this office on January 28, 1903, for the purpose of presenting for the consideration and criticism of those interested a system of harbor lines for the city of St. Louis and confronting towns on the Mississippi River. This meeting was well attended, some forty-five persons being present, representing all the chief interests fronting on the harbor. After reading the official correspondence leading up to the hearing, these representatives were asked to give their opinions, and requests were made for suggestions.

After the lines, which had been laid tentatively in pencil, had been explained there seemed to be a practically unanimous sentiment in their favor. Mr. J. K. Cummings, a director in the North St. Louis Citizens' Association, objected to certain features, but was overruled by the majority, and his desire to have the river straightened above the city was unanimously condemned.

The lines follow very close the old city lines from the southern limit of the city of St. Louis to the Eads Bridge (Illinois and St. Louis bridge), but depart therefrom between the Eads and Merchants bridges in order to secure an even bend in the river. This feature was approved in the hearing.



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Accompanying this letter I have the honor to submit a typewritten description of all the lines laid down on the accompanying map,<sup>a</sup> which is prepared for the signature of the honorable the Secretary of War. Certain letters<sup>a</sup> of approval are inclosed.

I would respectfully request that the tracing be returned to this office as soon as approved, in order that blueprints may be made therefrom for distribution.

Very respectfully, your obedient servant,

THOS. L. CASEY,  
*Major, Corps of Engineers.*

Brig. Gen. G. L. GILLESPIE,  
*Chief of Engineers, U. S. Army.*

[First indorsement.]

OFFICE CHIEF OF ENGINEERS,  
U. S. ARMY,  
*March 25, 1903.*

Respectfully submitted to the Secretary of War.

Request having been made for the establishment of harbor lines on the Mississippi River at and near St. Louis, Mo., the matter was referred to the local engineer officer at St. Louis for investigation, with a view to the selection of lines which would best subserve the various interests involved.

Attention is invited to the within report of Major Casey, from which it will be seen that the subject has received careful consideration, and that a public hearing has been held, which was well attended by parties interested to whom the lines recommended appeared to be satisfactory. It is remarked that certain features were objected to by a director in the North St. Louis Citizens' Association, but such objections were overruled by the majority, and attention is invited to Major Casey's further report,<sup>a</sup> dated the 20th instant, regarding these objections.

It is recommended that the lines thus agreed upon, which are delineated upon the accompanying chart<sup>a</sup> and described in a separate paper, be approved by the Secretary of War, and that the Secretary place his approval upon the chart and description, both of which have been prepared for his signature.

A. MACKENZIE,  
*Acting Chief of Engineers.*

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DESCRIPTION OF A SYSTEM OF HARBOR OR WHARF LINES FOR THE CITY OF ST. LOUIS, MO., AND THE CONFRONTING TOWNS IN ILLINOIS, ADOPTED BY THE UNITED STATES WAR DEPARTMENT, 1903.

The bank-full lines marking the limits, in Missouri and Illinois, of the legal navigable channel, are hereinafter designated "western and eastern inner harbor lines," respectively, and the lines marking the bottoms of the levee slopes at the low-water lines of 1863, on the respective shores, are designated "western and eastern outer harbor lines."

The western inner harbor line, as herein described and defined, from the southern to the northern limits of the city of St. Louis, Mo., is the line of reference for both the western outer harbor line and the eastern inner harbor line, but the eastern inner harbor line is the reference for the eastern outer harbor line.

All distances given herein are horizontal and all ordinates described are rectangular.

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<sup>a</sup> Not printed.

## (1) WESTERN INNER HARBOR LINE.

The western inner harbor line, or the west wharf line of the city of St. Louis, is hereby established as follows:

- (1) Southern limit. Commencing at a point (1) in the southern boundary line of the city, which point is in the eastern prolongation of the line from "stone 2" to "stone 1" and 225 feet from "stone 1;"
- (2) Davis street. thence to a point (2) in the north line of Davis street, 780 feet eastward from the southwest corner of block No. 3187;
- (3) Steins street. thence to a point (3) in the north line of Steins street 270 feet eastward from the southwest corner of block No. 3088;
- (3a) Ordinate. thence to a point (3a) 12 feet from the middle and on the westward side of the straight line joining the fixed point (3) with a point (4) hereinafter described;
- (4) Kraus street. thence to a point (4) in the eastern prolongation of the south line of Kraus street 1,070 feet from the northwest corner of block No. 3008;
- (5) Kansas street. thence to a point (5) in the eastern prolongation of the south line of Kansas street 780 feet from the northwest corner of block No. 2976;
- (5a) Ordinate. thence to a point (5a) 10 feet from the middle and on the westward side of the straight line joining the fixed point (5) with a point (6) hereinafter described;
- (6) Dover street. thence to a point (6) in the eastern prolongation of the north line of Dover street 350 feet from the southwest corner of block No. 2888;
- (6a) Ordinates. thence, successively, to three points (6a, 6b, and 6c)
- (6b) in the ordinates which divide into four equal parts the
- (6c) straight line joining the fixed point (6) with a point (7) hereinafter described; the said three points, in order northward, being 12, 17, and 12 feet westward from the said straight line;
- (7) Maeder street. thence to a point (7) in the eastern prolongation of the south line of Maeder street 580 feet from the northwest corner of block No. 2791;
- (7a) Ordinates. thence, successively, to three points (7a, 7b, and 7c),
- (7b) in the ordinates which divide into four equal parts
- (7c) the straight line joining the fixed point (7) with a point (8) hereinafter described; the said three points, in order northward, being 14, 18, and 14 feet westward from the said straight line;
- (8) Neosha street. thence to a point (8) in the eastern prolongation of the north line of Neosha street west of Broadway 1,440 feet from the southeast corner of block No. 2718;
- (8a) Ordinates. thence, successively, to four points (8a, 8b, 8c, and
- (8b) 8d) in the ordinates which divide into five equal parts
- (8c) the straight line joining the fixed point (8) with a
- (8d) point (9) hereinafter described; the said four points, in order northward, being 21, 34, 37, and 28 feet westward from the said straight line;
- (9) Meramec street. thence to a point (9) in the eastern prolongation of the south line of Meramec street west of Marine avenue 1,325 feet from the northwest corner of block No. 2665;
- (9a) Ordinate. thence to a point (9a) 10 feet from the middle and on the westward side of the straight line joining the fixed point (9) with a point (10) hereinafter described;
- (10) Osage street. thence to a point (10) in the eastern prolongation of the south line of Osage street, 890 feet from the northwest corner of block No. 2612;
- (10a) Ordinate. thence to a point (10a) 5 feet from the middle and on the westward side of the straight line joining the fixed point (10) with a point (11) hereinafter described;

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- (11) Cahokia street.      thence to a point (11) in the eastern prolongation of the south line of Cahokia street 1,200 feet from the northwest corner of block No. 1762;
- (12) President street.    thence to a point (12) in the eastern prolongation of the south line of President street 1,030 feet from the northwest corner of block No. 1774;
- (13) Cherokee street.    thence to a point (13) in the eastern prolongation of the south line of Cherokee street 930 feet from the northwest corner of block No. 1787;
- (14) Utah street.        thence to a point (14) in the south line of Utah street 890 feet eastward from the northwest corner of block No. 2038;
- (14a) Ordinate.        thence to a point (14a) 5 feet from the middle and on the eastward side of the straight line joining the fixed point (14) with a point (15) hereinafter described;
- (15) Arsenal street.      thence to a point (15) in the north line of Arsenal street 1,425 feet eastward from the southwest corner of block No. 2017;
- (15a) Ordinate.        thence to a point (15a) 5 feet from the middle and on the eastward side of the straight line joining the fixed point (15) with a point (16) hereinafter described;
- (16) Dorcas street.      thence to a point (16) in the south line of Dorcas street 1,355 feet eastward from the northwest corner of block No. 2017;
- (16a) Ordinates.        thence, successively, to three points (16a, 16b, and 16c), in the ordinates which divide into four equal parts the straight line joining the fixed point (16) with a point (17) hereinafter described, the said three points, in order northward, being 20, 25, and 20 feet eastward from the said straight line;
- (16b)
- (16c)
- (17) St. George street.    thence to a point (17) in the eastern prolongation of the north line of St. George street 53 feet from the southeast corner of block No. 776;
- (17a) Ordinate.        thence to a point (17a) 5 feet from the middle and on eastward side of the straight line joining the fixed point (17) with a point (18) hereinafter described;
- (18) Victor street.      thence to a point (18) in the eastern prolongation of the south line of Victor street 53 feet from the northeast corner of block No. 777;
- (18a) Ordinate.        thence to a point (18a) 5 feet from the middle and on the eastward side of the straight line joining the fixed point (18) with a point (19) hereinafter described;
- (19) Barton street.      thence to a point (19) in the eastern prolongation of the south line of Barton street, 90 feet from the northeast corner of block No. 871;
- (19a) Ordinates.        thence, successively, to three points (19a, 19b, and 19c) in the ordinates which divide into four equal parts the straight line joining the fixed point (19) with a point (20) hereinafter described, the said three points, in order northward, being 12, 16, and 10 feet eastward from the said straight line;
- (19b)
- (19c)
- (20) Lesperance street.    thence to a point (20) in the eastern prolongation of the north line of Lesperance street 50 feet from the southeast corner of block No. 866;
- (20a) Ordinate.        thence to a point (20a) 5 feet from the middle and on the eastward side of the straight line joining the fixed point (20) with a point (21) hereinafter described;
- (21) Carroll street.      thence to a point (21) in the eastern prolongation of the north line of Carroll street 110 feet from the southeast corner of block No. 863;
- (22) Miller street.      thence to a point (22) in the eastern prolongation of the north line of Miller street 140 feet from the southeast corner of block No. 860;
- (23) Rutger street.      thence to a point (23) in the eastern prolongation of the south line of Rutger street 140 feet from the northeast corner of block No. 859;
- (24) Convent street.     thence to a point (24) in the eastern prolongation of the south line of Convent street 127 feet from the northeast corner of block No. 858;

- (25) Chouteau avenue      thence to a point (25) in the eastern prolongation of the south line of Chouteau avenue 100 feet from the northeast corner of block No. 857 N;
- (26) Gratiot street.      thence to a point (26) in the eastern prolongation of the south line of Gratiot street 72 feet from the northeast corner of block No. 855;
- (27) Plum street.      thence to a point (27) in the eastern prolongation of the south line of Plum street 84 feet from the northeast corner of block No. 853;
- (28) Spruce street.      thence to a point (28) in the eastern prolongation of the south line of Spruce street 86 feet from the northeast corner of block No. 3;
- (29) Elm street.      thence to a point (29) in the eastern prolongation of the south line of Elm street 80 feet from the northeast corner of block No. 5;
- (30) Market street.      thence to a point (30) in the eastern prolongation of the south line of Market street 70 feet from the northeast corner of block No. 7;
- (31) Pine street.      thence to a point (31) in the eastern prolongation of the south line of Pine street 45 feet from the northeast corner of block No. 9;
- (32) Locust street.      thence to a point (32) in the eastern prolongation of the south line of Locust street 15 feet from the northeast corner of block No. 11;
- (33) Washington avenue.      thence to a point (33) in the eastern prolongation of the south line of Washington avenue 23 feet from the northeast corner of block No. 13;
- (34) Morgan street.      thence to a point (34) in the eastern prolongation of the north line of Morgan street 12 feet from the southeast corner of block No. 16;
- (34a) Ordinates.      thence, successively, to three points (34a, 34b, and
- (34b)      34c) in the ordinates which divide into four equal
- (34c)      parts the straight line joining the fixed point (34) with a point (35) hereinafter described, the said three points, in order northward, being 13, 20, and 15 feet eastward from the said straight line;
- (35) Biddle street.      thence to a point (35) in the eastern prolongation of the south line of Biddle street 320 feet from the northwest corner of block No. 19;
- (36) Ashley street.      thence to a point (36) in the eastern prolongation of the north line of Ashley street 126 feet from the southeast corner of block No. 228;
- (36a) Ordinate.      thence to a point (36a) 5 feet from the middle and on the eastward side of the straight line joining the fixed point (36) with a point (37) hereinafter described;
- (37) Smith street.      thence to a point (37) in the eastern prolongation of the south line of Smith street, 205 feet from the northeast corner of block No. 230;
- (38) Florida street.      thence to a point (38) in the eastern prolongation of the south line of Florida street 220 feet from the northeast corner of block No. 232;
- (39) Mullanphy street.      thence to a point (39) in the eastern prolongation of the north line of Mullanphy street 147 feet from the southeast corner of block No. 234;
- (40) Mound street.      thence to a point (40) in the eastern prolongation of the south line of Mound street 185 feet from the northeast corner of block No. 235;
- (41) Brooklyn street.      thence to a point (41) in the eastern prolongation of the north line of Brooklyn street 250 feet from the southeast corner of block No. 237;
- (41a) Ordinate.      thence to a point (41a) 6 feet from the middle and on the eastward side of the straight line joining the fixed point (41) with a point (42) hereinafter described;
- (42) Tyler street.      thence to a point (42) in the eastern prolongation of the north line of Tyler street 385 feet from the southeast corner of block No. 289 E;
- (43) Madison street.      thence to a point (43) in the eastern prolongation of the north line of Madison street 437 feet from the southeast corner of block No. 291 E;

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- (44) North Market street. thence to a point (44) in the eastern prolongation of the south line of North Market street 500 feet from the northeast corner of block No. 2142;
- (45) Warren street. thence to a point (45) in the eastern prolongation of the north line of Warren street 550 feet from the southeast corner of block No. 672 E;
- (46) St. Louis avenue. thence to a point (46) in the eastern prolongation of the north line of St. Louis avenue 580 feet from the southeast corner of block No. 668 E;
- (47) Dock street. thence to a point (47) in the eastern prolongation of the north line of Dock street 490 feet from the southeast corner of block No. 2544;
- (48) Destrehan street. thence to a point (48) in the eastern prolongation of the north line of Destrehan street 460 feet from the southeast corner of block No. 2538;
- (49) Salisbury street. thence to a point (49) in the eastern prolongation of the north line of Salisbury street 435 feet from the southeast corner of block No. 2534;
- (50) Bremen avenue. thence to a point (50) in the eastern prolongation of the north line of Bremen avenue 395 feet from the southeast corner of block No. 2525;
- (50a) Ordinate. thence to a point (50a) 10 feet from the middle and on the eastward side of the straight line joining the fixed point (50) with a point (51) hereinafter described;
- (51) Angelica street. thence to a point (51) in the eastern prolongation of the north line of Angelica street 270 feet from the southeast corner of block No. 2507;
- (52) Ferry street. thence to a point (52) in the eastern prolongation of the south line of Ferry street 150 feet from the northeast corner of block No. 2506;
- (52a) Ordinates. thence, successively, to three points, (52a, 52b, and 52c) in the ordinates which divide into four equal parts the straight line joining the fixed point (52) with a point (53) hereinafter described, the said three points, in order northward, being 35, 45, and 35 feet eastward from the said straight line;
- (52b)
- (52c)
- (53) Grand avenue. thence to a point (53) in the north line of Grand avenue 390 feet eastward from the southeast corner of block No. 3322;
- (53a) Ordinate. thence to a point (53a) 10 feet from the middle and on the eastward side of the straight line joining the fixed point (53) with a point (54) hereinafter described;
- (54) Prairie avenue. thence to a point (54) in the eastern prolongation of the south line of Prairie avenue 420 feet from the northeast corner of block No. 3334;
- (54a) Ordinates. thence, successively, to eight points (54a, 54b, 54c, 54d, 54e, 54f, 54g, and 54h) in the ordinates which divide into nine equal parts the straight line joining the fixed point (54) with a point (55) hereinafter described, the said eight points, in order northward, being 47, 125, 210, 275, 290, 280, 230, and 145 feet westward from the said straight line;
- (54b)
- (54c)
- (54d)
- (54e)
- (54f)
- (54g)
- (54h)
- (55) Humboldt avenue. thence to a point (55) in the north line of Humboldt avenue 2,070 feet eastward from the southeast corner of block No. 4210;
- (55a) Ordinates. thence, successively, to nine points (55a, 55b, 55c, 55d, 55e, 55f, 55g, 55h, and 55i) in the ordinates which divide into ten equal parts the straight line joining the fixed point (55) with a point (56) hereinafter described, the said nine points, in order northward, being 147, 260, 350, 408, 430, 416, 363, 278, and 155 feet westward from the said straight line;
- (55b)
- (55c)
- (55d)
- (55e)
- (55f)
- (55g)
- (55h)
- (55i)
- (56) Baden avenue. thence to a point (56) in the eastern prolongation of the north line of Baden avenue 2,980 feet from the southwest corner of block No. 4264;

- (56a) Ordinates. thence, successively, to eight points (56a, 56b, 56c, 56d, 56e, 56f, 56g, and 56h) in the ordinates which divide into nine equal parts the straight line joining the fixed point (56) with a point (57) hereinafter described, the said eight points, in order northward, being 110, 193, 260, 303, 316, 290, 228, and 130 feet westward from the said straight line;
- (56b)
- (56c)
- (56d)
- (56e)
- (56f)
- (56g)
- (56h)
- (57) St. Cyr avenue. thence to a point (57) in the eastern prolongation of the north line of St. Cyr avenue 900 feet from the southeast corner of block No. 4313 E;
- (57a) Ordinates. thence, successively, to nine points (57a, 57b, 57c, 57d, 57e, 57f, 57g, 57h, and 57i) in the ordinates which divide into ten equal parts the straight line joining the fixed point (57) with a point (58) hereinafter described, the said nine points, in order northward, being 137, 247, 337, 377, 385, 367, 307, 223, and 115 feet westward from the said straight line;
- (57b)
- (57c)
- (57d)
- (57e)
- (57f)
- (57g)
- (57h)
- (57i)
- (58) near Gibson road. thence to a point (58) in the southern prolongation of the line which coincides with the west face of the coping on the east wall of the settling basins at the Chain of Rocks, the said point being 3,245 feet from the north face of the coping on the south wall of settling basin No. 6;
- (58a) Ordinates. thence, successively, to thirteen points (58a, 58b, 58c, 58d, 58e, 58f, 58g, 58h, 58i, 58k, 58l, 58m, and 58n) in the ordinates which divide into fourteen equal parts the straight line joining the fixed point (58) with a point (59) hereinafter described, the said thirteen points, in order northward, being 175, 340, 483, 610, 703, 760, 787, 787, 750, 675, 555, 400, and 212 feet eastward from the said straight line;
- (58b)
- (58c)
- (58d)
- (58e)
- (58f)
- (58g)
- (58h)
- (58i)
- (58k)
- (58l)
- (58m)
- (58n)
- (59) near Homer dike. thence to a point (59) in the northern prolongation of the line which coincides with the west face of the coping on the east wall of the settling basins at the Chain of Rocks, the said point being 1,215 feet from the south face of the coping on the north wall of settling basin No. 1;
- (59a) Ordinates. thence, successively, to four points (59a, 59b, 59c, and 59d) in the ordinates which divide into five equal parts the straight line joining the fixed point (59) with a point (60) hereinafter described, the said four points, in order northward, being 30, 65, 87, and 60 feet westward from the said straight line;
- (59b)
- (59c)
- (59d)
- (60) Northern limit. thence to and ending at a point (60) in the northern boundary line of the city in the eastern prolongation of the line "stone 172" to "stone 174," 170 feet from "stone 174."

(II) *Western outer harbor line.*

The western outer harbor line shall be eastward from the western inner harbor line, and it shall be 250 feet distant and parallel thereto from point 1, at the southern limit of the city of St. Louis, to point 34a, near Franklin avenue, and from point 40, at Mound street, to point 60, at the northern city limit. Between Franklin avenue and Mound street it shall be distant as follows: 247 feet at point 34b, 242 feet at point 34c, 238 feet at point 35 (Biddle street), 230 feet at point 36, (Ashley street), 225 feet at point 36a, 222 feet at point 37 (Smith street), 228 feet at point 38 (Florida street), and 237 feet at point 39 (Mullanphy street); these exceptional distances pertaining to the present levee.

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(III) *Eastern inner harbor line.*

The eastern inner harbor line shall be eastward from the western inner harbor line, and it shall be 2,000 feet distant and parallel thereto from point 1, at the southern limit of the city of St. Louis, to point 34a, near Franklin avenue, and from point 40, at Mound street, to point 57c, near Glendale avenue; between Franklin avenue and Mound street it shall be distant as follows: 1,997 feet at point 34b, 1,992 feet at point 34c, 1,988 feet at point 35 (Biddle street), 1,980 feet at point 36 (Ashley street), 1,975 feet at point 36a, 1,972 feet at point 37 (Smith street), 1,978 feet at point 38 (Florida street), and 1,987 feet at point 39 (Mullanphy street); between point 57c, near Glendale avenue, and point 60, at the northern city limit, it shall be distant as follows: 2,040 feet at point 57d, 2,080 feet at point 57e, 2,130 feet at point 57f, 2,180 feet at point 57g, 2,220 feet at point 57h, 2,260 feet at point 57i, 2,290 feet at point 58, near Gibson Road, 2,310 feet at point 58a, 2,340 feet at point 58b, 2,375 feet at point 58c, 2,410 feet at point 58d, 2,460 feet at point 58e, 2,520 feet at point 58f, 2,590 feet at point 58g, 2,650 feet at point 58h, 2,710 feet at point 58i, 2,755 feet at point 58k, 2,800 feet at point 58l, 2,800 feet at point 58m, 2,800 feet at point 58n, 2,790 feet at point 59, near Homer dike, 2,720 feet at point 59a, 2,590 feet at point 59b, 2,500 feet at point 59c, 2,420 feet at point 59d, 2,430 feet at point 60, at the northern city limit.

(IV) *Eastern outer harbor line.*

The eastern outer harbor line shall be 250 feet westward from and parallel to the eastern inner harbor line.

[First indorsement.]

WAR DEPARTMENT, *April 6, 1903.*

Approved.

E. ROOT, *Secretary of War.*

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The operations extend from Minneapolis to the mouth of the Missouri River, a distance of about 670 miles, following the low water channel.

The plant belonging to the work consists of the snag boats *Colonel A. Mackenzie* and *J. G. Parke*, but dredges, drill boats, and tenders are borrowed from other appropriations when required. The snag boats were built in 1900 and 1882.

The general improvement of the river has so reduced the extent of caving banks that but one snag boat is required, the *J. G. Parke*, which has been used as a towboat for several years and which is now in bad condition, being laid up.

The details of work accomplished are given in the appended report or Assistant Engineer C. W. Durham.

The total tonnage of the river between Falls of St. Anthony and mouth of Missouri River for the calendar year 1902 was, approximately, 1,900,000 tons, and the ton-miles 527,140,000. This includes logs and lumber.

## Money statement.

June 30, 1903, amount drawn from Treasury under permanent appropriation .....	\$25,000.00
June 30, 1903, amount expended during fiscal year .....	25,000.00
July 1, 1903, amount available under permanent appropriation of August 11, 1888, for fiscal year ending June 30, 1904 .....	25,000.00

## ABSTRACT OF APPROPRIATIONS AND ALLOTMENTS.

By act approved March 2, 1867 .	\$96,000	By act of August 11, 1888, for fiscal year ending—	
By allotment from appropriation of July 25, 1868 .....	26,000	June 30, 1889 .....	\$25,000
By allotment from appropriation of 1869 .....	35,640	June 30, 1890 .....	25,000
By act approved—		June 30, 1891 .....	25,000
July 11, 1870 .....	36,000	June 30, 1892 .....	25,000
March 3, 1871 .....	42,000	June 30, 1893 .....	25,000
June 10, 1872 .....	42,000	June 30, 1894 .....	25,000
March 3, 1873 .....	25,000	June 30, 1895 .....	25,000
June 23, 1874 .....	25,000	June 30, 1896 .....	25,000
March 3, 1875 .....	25,000	June 30, 1897 .....	25,000
August 14, 1876 .....	30,000	June 30, 1898 .....	25,000
June 18, 1878 .....	41,500	June 30, 1899 .....	25,000
March 3, 1879 .....	20,000	June 30, 1900 .....	24,944
June 14, 1880 .....	8,000	June 30, 1901 .....	25,000
March 3, 1881 .....	25,000	June 30, 1902 .....	25,000
By act passed August 2, 1882 ..	25,000	June 30, 1903 .....	25,000
By act approved August 5, 1886 .	22,500	Total .....	899,584

## STATISTICS OF COMMERCE AND NAVIGATION.

*Lumber.*—The most important business carried on in connection with the navigation of the upper Mississippi River and its principal tributaries is the lumber trade, which gave employment in 1902 to about 70 towboats, valued at \$400,000. Along the river from Minneapolis to St. Louis 47 sawmills were operated by 32 wholesale firms, having an invested capital of about \$25,000,000. Their manufactures of white pine in 1901 were: Lumber, 862,306,000 feet B. M.; shingles, 164,577,000; lath, 196,389,000, and of hemlock lumber, 23,282,000 feet B. M. In addition to the manufacturers there are a great many retail or distributing firms.



*Lumber manufacture, upper Mississippi River Valley, 1902.*

[Value about \$35,000,000.]

Locality.	Lumber.	Shingles.
	<i>Feet B. M.</i>	<i>Number.</i>
Above Minneapolis.....	48,871,000	21,895,000
Minneapolis.....	375,856,000	138,196,000
St. Paul to St. Louis.....	777,450,000	336,919,000
St. Croix River.....	148,282,000	71,758,000
Chippewa River.....	306,010,000	69,563,000
Black River.....	198,835,000	116,596,000
Total.....	1,854,304,000	754,927,000

The larger part of the above was floated for greater or less distance on the Mississippi River, either as logs or lumber.

*Statement of distribution of lumber manufacture along the upper Mississippi River, from Minneapolis to St. Louis, in 1902.*

Locality.	Lumber.	Shingles.	Lath.
	<i>Feet B. M.</i>	<i>Number.</i>	<i>Number.</i>
Minneapolis.....	465,204,000	62,945,000	90,576,000
Hastings.....	3,000,000	250,000	500,000
Redwing.....	9,074,000	2,633,000	2,563,000
Winona.....	65,000,000	35,256,000	28,085,000
La Crosse.....	27,926,000	21,754,000	6,489,000
Guttenberg.....	15,250,000	2,200,000	2,170,000
Dubuque.....	37,000,000	8,000,000	5,000,000
Bellevue.....	3,000,000		2,000,000
Clinton.....	62,425,000	11,616,000	10,858,000
Davenport.....	35,967,000	3,915,000	7,360,000
Rock Island.....	46,000,000	6,313,000	14,025,000
Muscatine.....	45,060,000	8,915,000	12,152,000
Burlington.....	20,000,000	3,800,000	10,000,000
Fort Madison.....	12,400,000	1,730,000	1,361,000
Keokuk.....	15,000,000	5,250,000	8,250,000
Total.....	862,306,000	174,577,000	196,389,000

*Steamboats and freight.*—There were employed as rafters during the season of 1902, between St. Paul and St. Louis, 70 stern-wheel steamboats, large and small; 21 stern-wheel and 2 side-wheel packets; 2 contractor's stern-wheel boats; 42 pleasure boats, some of which have propellers; 11 ferry boats, and 16 Government boats, of which 2 are side-wheelers; in all, 166 steamboats.

The principal steamboat lines on the upper Mississippi River are those of the Diamond Jo, the Eagle, the Carnival City, and the Acme Packet companies. For the season of 1902 the amount of freight and number of passengers could not be very accurately ascertained, but tolerably complete reports give 139,000 tons of freight and 538,623 passengers, not including those of ferry boats. Taking into consideration the logs and lumber floated down the stream, the gross tonnage for 1902 was approximately 1,900,000 tons, and, from tolerably accurate information of the distances freight was carried, the estimated ton-miles are 527,140,000.

At St. Louis there were received in 1902 from the upper Mississippi River by boats, barges, and rafts 82,405 tons of merchandise, including pine lumber and shingles. There were shipped to points on the upper Mississippi River 23,130 tons.

The following table affords a view of the amount of navigation at various localities on the upper Mississippi River for the year 1902:

*List of steamboats, barges, and rafts passing through various bridges.*

Locality of bridge.	Miles from St. Paul.	Steamboats.	Barges.	Rafts.
St. Paul Park.....	11	2,106	(a)	739
Hastings.....	28	2,235	217	727
Prescott.....	30	3,089	(a)	(a)
Winona.....	116	3,240	1,014	939
La Crosse.....	143	2,426	657	478
Dubuque.....	265	1,616	1,285	348
Sabula.....	310	1,640	725	276

a No record.

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*List of steamboats, barges, and rafts passing through various bridges—Continued.*

Locality of bridge.	Miles from St. Paul.	Steam-boats.	Barges.	Rafts.
Clinton .....	327	1,858	489	a 127
Rock Island .....	363	1,800	507	237
Kelthsburg .....	417	488	181	123
Burlington .....	441	1,520	638	124
Fort Madison .....	462	1,214	305	80
Keokuk .....	484	1,146	333	30
Quincy .....	521	1,111	259	31
Hannibal .....	540	865	404	13
Louisiana .....	568	884	310	91
Alton .....	652	1,548	143	17

a Partial record.

*Internal revenue for the year ending December 31, 1902, collected in districts bordering on the upper Mississippi River.*

District.	Office.	Amount.
Minnesota .....	St. Paul .....	\$1,729,527.73
Second Wisconsin .....	Madison .....	910,959.92
Third Iowa .....	Dubuque .....	471,588.19
Fourth Iowa .....	Burlington .....	552,314.11
Fifth Illinois .....	Peoria .....	31,692,965.47
Eighth Illinois .....	Springfield .....	10,931,345.36
Thirteenth Illinois .....	East St. Louis .....	566,057.96
First Missouri .....	St. Louis .....	10,588,877.39
Total .....		57,443,646.15

*Customs revenue and tonnage for the year ending December 31, 1902.*

Port.	Collections.	Tonnage enrolled.	Vessels.
St. Paul, Minn. ....	\$850,319.68	2,739	31
La Crosse, Wis. ....	9.41	3,423	45
Dubuque, Iowa .....	29,751.69	3,548	14
Rock Island, Ill. ....	6.23	5,841	103
Burlington, Iowa .....	24.18	2,377	26
St. Louis, Mo. a .....	1,906,151.43	69,401	162
Total .....	2,786,262.62	87,329	381

a Only a part of the St. Louis statement is applicable to the upper Mississippi.

*Summary of expenditures for operating snag boats and dredge boats on upper Mississippi River for fiscal year ending June 30, 1903.*

Month.	Office expenses, superintendence, and contingencies.	Care, repair, and operating snag boats and dredge boats.						Grand total.
		Labor.	Subsistence.	Fuel.	Expense.	Repairs.	Total.	
1902.								
July.....	\$150.00	\$1,242.00	\$433.59	\$358.68	\$197.28	\$135.46	\$2,367.01	\$2,517.01
August.....	150.00	2,206.53	173.14	338.04	191.45	72.08	2,981.24	3,131.24
September.....	154.25	1,268.50	615.62	632.66	621.66	13.42	3,151.86	3,306.11
October.....	150.00	2,528.19	374.79	616.09	76.56	15.36	3,610.99	3,760.99
November.....	150.00	948.79	235.08	568.94	93.06	28.35	1,874.22	2,024.22
December.....		215.00					215.00	215.00
1903.								
January.....		215.00					215.00	215.00
February.....	253.25	215.00				7.72	222.72	475.97
March.....	6.47					84.90	84.90	91.37
April.....	660.66	1,412.44	467.85	259.19	221.71	462.58	2,823.77	3,484.43
May.....	150.00	1,227.00	304.66	442.34	7.08	139.69	2,120.77	2,270.77
June.....	560.00	1,494.00	275.90	985.19	60.82	131.98	2,947.99	3,507.89
Total.....	2,384.63	12,972.45	2,880.63	4,261.13	1,469.62	1,091.54	22,615.37	25,000.00

REPORT OF MR. C. W. DURHAM, ASSISTANT ENGINEER.

UNITED STATES ENGINEER OFFICE,  
Rock Island, Ill., July 1, 1903.

MAJOR: I have the honor to present my report on the operations of snag boats and dredge boats on upper Mississippi River for the fiscal year ending June 30, 1903.

*Operations of snag boat Col. A. Mackenzie.*—The *Mackenzie* was employed from July 1 to November 13, 1902, and from April 13 to June 30, 1903, in removing snags and other obstructions, placing buoys, making surveys, and otherwise assisting the interests of navigation between Minneapolis and the mouth of the Missouri River.

Leaving Hickory Chute (mile 563) on the morning of July 1, 1902, and proceeding up river, the *Mackenzie* arrived at St. Paul on the 18th; left St. Paul on the 22d, worked down river to Rock Island (mile 362), and thence back to St. Paul on August 22. From St. Paul she proceeded down river and reached St. Louis (mile 676) September 9, and thence returning arrived at St. Paul on October 2. On this latter trip a profile of the river channel was made with the sounding machine from Montrose (mile 472) to St. Paul. In July 22 buoys were placed to aid navigators, and a survey of the harbor at Fulton (mile 325) was made. In August the boilers of the wrecked steamer *Ravenna* were recovered at Maquoketa River (mile 258) and placed on the hull, which was towed to Eagle Point (mile 262). Surveys were made at Rockingham Slough (mile 367) and below Horse Island (mile 371). In September a survey of the river in the vicinity of Burlington (mile 443) was made.

The *Mackenzie* left St. Paul October 4, arrived at St. Louis on the 12th, and returning up river reached Rock Island on the 23d. On this trip dredge *Phoenix* and two dumps were towed from Hamburg (mile 593) to Burlington, and a survey was made in vicinity of Johnsons Island (miles 422–424). Leaving Rock Island October 27, the snag boat proceeded to St. Louis, and thence returned to Keokuk (mile 484) and was laid up for the winter in the Des Moines Rapids Canal November 13. On this trip channel soundings were made from the Missouri River to Keokuk, and the U. S. steamer *J. G. Parke* was towed up river from Portage (mile 641) to the canal.

In 1903, the *Mackenzie* having been repainted and otherwise repaired, left her winter quarters on April 13 and proceeded to St. Louis (mile 676), where she arrived on the 14th; returning up river she reached St. Paul on the 30th. On this trip a general inspection of plant was made, and buoys were placed between Burlington (mile 442) and Rock Island (mile 363).

Leaving St. Paul on May 1, the *Mackenzie* proceeded down river, reaching St. Louis on the 9th, and returning thence arrived at Rock Island on the 30th. From June 3 to 18 the *Mackenzie* was engaged in rendering assistance at the various levees below Keokuk that were broken by flood, returning to Rock Island on the latter date. Leaving Rock Island June 23, she proceeded up river as far as the head of Guttenberg channel (mile 225), and thence returned to Rock Island June 30. On June 24 and 25 a survey of Galena River was made.

*Summary of operations of snag boat Col. A. Mackenzie for fiscal year ending June 30, 1903.*

Snags removed.....	271
Stumps destroyed.....	158
Leaning trees pulled back.....	212
Leaning trees felled.....	1, 869
Wreck removed.....	1
Steamboat assisted.....	1
Surveys, days.....	7
Buoys placed.....	33
Miles run.....	6, 845

*Dredging in Fulton Harbor.*—A deposit of sediment had accumulated along shore at this locality (mile 325) and prevented boats from landing at low stages of water. To afford relief dredge *Ajax*, with single crew, worked from August 21 to 30, 1902, and excavated down to bed rock a section 75 feet in length from the levee out to deep water. An area of 12,000 square feet was covered, and 3,614 cubic yards of material were removed, at a cost (exclusive of plant charges) of \$432.21, or \$0.12 per cubic yard.

*Dredging at Wilds Landing and Beef Slough.*—Dredge *Vulcan*, with single crew, was engaged from August 4 to 13, 1902, in removing the outer 200 feet of Dam 30 (sheet 117, mile 113). She then worked until August 18 widening the channel at the foot of Blackbird Slough (mile 114). The bar at the mouth of Beef River (mile 87) having become troublesome, the *Vulcan* was moved to that point and worked from August 21 to September 13, assisting in making a good channel through the bar. The cost of the above work was \$1,600.93.

*Dredging at Hamburg.*—From October 1 to 19, 1902, dredge *Phoenix*, with single crew, was employed in deepening the approach to the steamboat landing at Hamburg (mile 593). Two cuts, each about 30 feet wide and 6 feet deep at low water, were made in the bar—one about 1,100 feet long and the other about 900. The area covered by the dredge was 95,000 square feet, and the quantity of sand dredged and removed, 13,136 cubic yards. The amount expended on this work was \$896.29, and, adding the plant charge of \$366.20, the cost is brought up to \$1,262.49, or \$0.096 per cubic yard.

*Dredging Burlington Harbor.*—Dredge *Phoenix*, with single crew, was employed from October 25 to November 8, 1902, in removing the bar in front of the sewer and along the levee front at Burlington (mile 442). The bar in front of the sewer (in which a creek runs) extended out 200 feet from the wharf log, and was dry at a 3-foot stage; and from the upper side of the sewer to a point about 125 feet below the Diamond Jo warehouse the deposit extended out about 50 feet from the wharf log.

The entire bar was excavated to a grade of 6 feet at low water. The area covered by dredge was 51,700 square feet, and the material excavated, consisting of mud, sand, gravel, and a quantity of broken rock, 10,848 cubic yards.

The amount expended on this work was \$726.25, and, adding the plant charge of \$364, the cost is brought up to \$1,090.25, or \$0.10 per cubic yard.

The wreck of the burned ferry boat, the *John Taylor*, was also removed, and about 175 linear feet of sunken shore protection abreast of Moores Towhead.

*Opening Andalusia Dam.*—To permit the passage of boats into Andalusia Slough (mile 373), where there are extensive coal mines and quarries, U. S. dredge *Ajar* deepened, by dredging, a low part of the dam near its south end, and secured a channel through the dam 100 feet wide and 3 feet deep at low water. The dredged material, consisting of 880 cubic yards loose rock, was placed on a low part of the dam near its north end. This work was done May 6 to 10, 1903, and cost \$180.15.

*Summary of expenditures.*

Snag boat <i>Col. A. Mackenzie</i> , operating .....	\$18, 779. 54
Dredging at Fulton Harbor .....	432. 21
Dredging channel at Wilds Landing and Beef Slough .....	1, 600. 93
Dredging at Hamburg Landing .....	896. 29
Dredging at Burlington Harbor .....	726. 25
Dredging at Andalusia Dam .....	180. 15
Superintendence and office expenses .....	2, 384. 63
Total .....	25, 000. 00

Very respectfully, your obedient servant,

C. W. DURHAM,  
*Assistant Engineer*

Maj. JAS. L. Lusk,  
*Corps of Engineers.*

A A 2.

IMPROVEMENT OF MISSISSIPPI RIVER BETWEEN MOUTH OF MISSOURI RIVER AND ST. PAUL.

The work performed under this appropriation consists chiefly in the permanent improvement of through navigation, but improvements at harbors and other localities are frequently made under allotments contained in the various acts of Congress.

The original condition of the channel between the Missouri River and St. Paul was such that at low stages the larger boats were unable to proceed farther up the river than La Crosse or Winona, while at extreme low water navigation was impeded at points much lower. The original project for improvement, which has undergone no material change, was adopted in 1878, and contemplates the closure of chutes, revetment of caving banks, and contraction of the channel by

wing dams, so as to obtain a channel of a depth of  $4\frac{1}{2}$  feet at low water, to be eventually increased to 6 feet.

At the close of the fiscal year ending June 30, 1903, there had been expended \$10,448,559.97, which has resulted in such an improved condition of the channel as to permit the passage of the largest boats at very low stages through to St. Paul. It may be proper to state that of the amount above mentioned about \$2,500,000 has been expended on harbor and levee work, without much benefit to the main channel.

On July 1, 1902, there was unexpended \$459,820.75. During the past year, for the improvement of through navigation, dam construction, shore protection, dredging, removal of rock, etc., have been carried on by hired labor and use of Government plant between Wabasha (81 miles from St. Paul) and Bellevue (mile 288); at Rock Island Rapids (miles 349-363), and between Burlington (mile 442) and the Missouri River (mile 658); under contract between Rock Island (mile 363) and Burlington (mile 442). A pier for the harbor of refuge at North Pepin was built by hired labor.

The balance available July 1, 1903, will be applied, at such points as may seem most in need of improvement, by hired labor between Wabasha and Bellevue, at Rock Island Rapids, and between Hannibal and the Missouri River; by contract between Bellevue and Le Claire (mile 348), and between Rock Island and Hannibal (mile 540).

*Harbor of refuge at Pepin, east shore of Lake Pepin.*—The construction of a pier, intended to be 1,000 feet in length, running out into the lake from a point near foot of Dunn street (mile 74) was begun September 16, 1902, continued during remainder of season, resumed April 30, 1903, and completed June 9, 1903, as far as funds permitted.

*Harbor of refuge at Stockholm, on Lake Pepin.*—This harbor was improved by dredging, so that boats have no further difficulty in using it.

*St. Paul to Winona.*—By hired labor and use of Government plant, improvement work was carried on during season of 1902 in vicinity of Wilds Landing (miles 113-114), at mouth of Beef Slough (mile 87), and near Fountain City (miles 109-110). Thirteen wing dams and 3,300 linear feet of shore protection were built, and several dams were raised and lengthened. In 1903 work in construction and repair of dams was resumed in vicinity of Wabasha (mile 81) June 19, and carried on to end of fiscal year.

*Removing bar at Fountain City, Wis.*—A small quantity of dredging was done late in 1902, and the work was continued during the last week of June, 1903.

*Winona to Wisconsin River.*—In this section work was carried on in 1902 by hired labor and use of Government plant in vicinity of Dakota and Dresbach (miles 135-137). Eleven wing dams and 2,125 linear feet of shore protection were built. Several dams were repaired or lengthened. Similar work was resumed in June, 1903, in vicinity of Dresbach.

*Wisconsin River to Bellevue.*—Considerable dredging was performed, August to November, 1902, by U. S. hydraulic dredge *No. 203*, with a view to deepening Guttenberg channel at its upper end (miles 227-228), and it is believed the work will prove to be successful. With hired labor and Government plant, operations were carried on from August 9 to November 15, 1902, near Bellevue (mile 286), at Stone Slough (miles 281-282), and at Deadmans bar (miles 276-277.) Eight wing dams and 6,100 linear feet of shore protection were built. In

1903 the dredge resumed work in (Guttenburg channel (mile 231) on May 20, and continued with good results to end of year. Some repairs were made late in June, 1903, to the ferry dike opposite Bellevue.

*Rock Island Rapids.*—Excavation of rock from the channel was carried on by hired labor from August 3 to November 12, 1902, at Sycamore, Campbells, Moline, and Winnebago chains. Ledge rock, measuring 6,201 cubic yards in place, was broken up by the drill boats, to be removed by dredge in 1903. The buoys used on the rapids during season of navigation were taken up and stored for the winter in November, 1902, and were reset in April, 1903. Work was resumed on May 1, 1903, and continued until the end of the year at Campbells chain.

*Rock Island to Burlington.*—Under contract with Albert Kirchner, dated September 8, 1902, operations in 1902 were carried on in vicinity of Burlington (mile 442) and opposite Island 360, below Keithsburg (mile 422). Two dams and 1,435 linear feet of shore protection were built, and some repairs were made to existing works. In 1903 two dams were built at Burlington and three above Johnsons Island (mile 422). Under agreement with T. B. Davis, who furnished and put in place dredged material, consisting of rock and gravel, in return for the loan of a dredging plant, three wing dams were built from Illinois shore below Rock River (miles 367–369), and several were repaired.

*Flint Creek to Iowa River levee.*—Some repairs were made to shore protection in the Iowa River. Sections 3, 4, and 5, and 1,300 linear feet of the protection was carried to the top of the bank. From June 3 to 15, 1903, the towboat *Ruth*, with a force of laborers, aided by the landowners and their men, rendered good service in preventing breaks in the levee, which was threatened by flood.

*Burlington to Hannibal.*—By hired labor and use of Government plant some repairs were made to Dams 7, 16, and 24, in vicinity of Pontoosuc (miles 455–460), to shore protection below Alexandria (mile 490), and to shore protection at lower end of Gregory's bend (mile 496). This work was performed in September and October, 1902. In 1903, by contract, some repairs were made to two closing dams near Dallas (miles 452–459).

*Warsaw to Quincy levee.*—In Hackley chute (mile 494), where the bank was cutting and the levee in danger, about 800 linear feet of shore was protected in September, 1902, the mattress being made of boards. In April, 1903, some small repairs were made to the closing dam at head of Canton chute (mile 506), to prevent a cross current from cutting into the toe of the levee slope. Towboat *Lucia* and dredge *Phoenix* were employed from June 2 to June 5 in assisting in the endeavor to hold portions of this levee, and from June 24 to June 30 in partially closing a break in the Indian Grave district. The flood of June, 1903, made 23 breaks in this levee.

*Hannibal to mouth of Missouri River.*—The improvement work in this section of the river was performed by hired labor and use of Government plant. Work was done in the vicinity of Mundys Landing (mile 558) and in Hickory chute (miles 562–564). Five dams and 1,290 linear feet of shore protection were built, and considerable repairs were made to several pieces of shore protection.

The details of the above-mentioned improvements are given in the appended reports of assistants in local charge.

Commercial statistics accompany my report on operating snag boats and dredge boats on the upper Mississippi River.

*Summary of expenditures for calendar year ending December 31, 1902, for improving Mississippi River from Missouri River to St. Paul.*

St. Paul to Winona .....	\$36,096.77
Winona to Wisconsin River .....	46,321.92
Wisconsin River to Bellevue .....	39,409.62
Rock Island Rapids .....	14,786.53
Rock Island to Burlington .....	17,451.96
Burlington to Hannibal .....	2,154.50
Hannibal to Missouri River .....	35,551.70
Surveys and gauges .....	4,059.76
Construction, care, and repair of plant .....	46,685.91
Harbor of refuge at North Pepin .....	9,421.78
Warsaw to Quincy levee .....	915.81
Bar at Quincy .....	800.45
Dredging Quincy Bay .....	288.35
Fountain City Bay .....	536.85
Flint Creek to Iowa River levee .....	22.15
Channel at Clinton .....	50.00
<b>Total .....</b>	<b>254,554.06</b>

NOTE.—In above statement the retained percentage on contracts December 31, 1902, is included.

*Net expenditures on various sections of the river, harbors, levees, etc., between Minneapolis and the Missouri River from commencement of improvement to June 30, 1903.*

Locality.	Dis- tance.	Amount.	Per mile.
	<i>Miles.</i>		
St. Paul to Minneapolis .....		\$359,113.46	
St. Paul to Prescott .....	30	667,154.00	\$22,238
Prescott to Lake Pepin .....	26	338,219.92	13,006
Foot of Lake Pepin to Alma .....	11	437,706.21	39,791
Alma to Winona Bridge (Chicago and Northwestern) .....	28	661,326.33	14,333
Winona Bridge to La Crosse Bridge (Chicago, Milwaukee and St. Paul) .....	28	636,382.17	22,728
La Crosse Bridge to McGregor Bridge .....	64	650,632.81	10,168
McGregor Bridge to Dubuque Bridge (Illinois Central) .....	57	319,701.21	5,609
Dubuque Bridge to Clinton Bridge (Chicago and Northwestern) .....	62	381,645.23	6,154
Clinton Bridge to Le Claire .....	21	39,830.24	1,897
Rock Island Rapids .....	14	592,515.32	
Rock Island Bridge to Keithsburg Bridge .....	55	305,320.39	5,651
Keithsburg Bridge to Nashville .....	59	899,443.63	15,246
Keokuk Bridge to Quincy Bridge .....	37	549,244.66	14,844
Quincy Bridge to Clarksville .....	56	927,455.61	16,562
Clarksville to Cap au Gris .....	37	852,805.78	23,049
Cap au Gris to Illinois River .....	24	394,553.08	16,450
Illinois River to Missouri River .....	23	431,446.95	18,750
West St. Paul .....		15,000.00	
<b>Harbors in Lake Pepin:</b>			
At Bay City .....		1,000.00	
At Lake City .....		21,290.62	
At Stockholm .....		3,017.08	
At Kings Coulee .....		30,000.00	
At Pepin .....		14,000.00	
Fountain City Bay .....		536.85	
Harbor at La Crosse .....		5,000.00	
Vicinity of Prairie du Chien .....		30,000.00	
Harbors at Dubuque and East Dubuque .....		25,000.00	
Ice harbor at Dubuque .....		10,000.00	
Channel and harbor at Clinton .....		22,071.15	
Harbor at Port Byron .....		5,000.00	
Harbor at Rock Island .....		10,000.00	
Harbor at Muscatine .....		15,000.00	
Harbor at Burlington .....		5,000.00	
Harbor at Montrose .....		2,000.00	
Harbor at Quincy .....		13,180.98	
Harbor at Clarksville .....		15,000.00	
Quincy Bay .....		83,118.00	

<sup>a</sup> Amounts additional to those given above have been expended under special appropriations, as follows: Harbor at Stockholm, \$25,000; Lake City Harbor, \$20,000; La Crosse Harbor, \$12,000; Dubuque and East Dubuque harbors, \$41,000; ice harbor at Dubuque, \$35,500; Guttenberg channel, \$8,000; Rock Island Harbor, \$12,000; Andalusia channel, \$6,000; Muscatine Harbor, \$20,000; Fort Madison Harbor, \$24,100; Burlington channel and harbor, \$30,000; Quincy Harbor, \$15,000; Quincy Bay, \$45,000; Hannibal channel and harbor, \$45,000; Louisiana Harbor, \$10,000; Alton Harbor, \$108,000; vicinity of Alexandria, \$16,000; La Crosse to Root River, \$12,500; Rock Island Rapids, \$116,650; Des Moines Rapids, \$4,574,950; dry dock at Des Moines Rapids Canal, \$125,000; total, \$6,351,700.

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*Net expenditures on various sections of the river, harbors, levees, etc., between Minneapolis and the Missouri River from commencement of improvement to June 30, 1903—Cont'd.*

Locality.	Distance.	Amount.	Per mile.
	<i>Miles.</i>		
Hamburg Bay .....		\$10,000.00	.....
Flint Creek to Iowa River levee .....		298,929.16	.....
Warsaw to Quincy levee .....		94,496.95	.....
Sny Island levee .....		106,728.99	.....
Surveys, gauges, and meter work .....		221,931.10	.....
Snag boats and dredge boats and wrecking .....		82,098.35	.....
Practical test of Adams's flume .....		27,176.63	.....
Plant at estimated value .....		137,591.91	.....
Total .....		10,448,559.97	.....

*General statement showing net expenditures from the commencement of improvement, in 1878, to June 30, 1903, under various heads of appropriation.*

St. Paul to Des Moines Rapids .....	\$1,597,500.00
Minneapolis to Des Moines Rapids .....	1,100,000.00
Des Moines Rapids to Illinois River .....	1,330,000.00
Ohio River to Minneapolis, applied to "between mouth of Missouri River and Minneapolis" .....	3,000,000.01
Ohio River to St. Paul, applied to "between mouth of Missouri River and St. Paul" .....	3,470,937.63
	10,498,437.64
Less amount transferred to work at Lock and Dam No. 2, Mississippi River, between Minneapolis and St. Paul, act of August 18, 1894....	49,877.67
Total net expenditures .....	10,448,559.97
Balance July 1, 1903, Missouri River to St. Paul.....	559,062.38
Total appropriated .....	11,007,622.35

The restoration of deteriorated works has been provided for from funds appropriated for general improvement, but this item has now become of such importance that a separate estimate of \$30,000, based on the amount expended for repairs during the past fiscal year, is submitted for maintenance of improvement works.

*Money statement.*

July 1, 1902, balance unexpended .....	\$459,820.75
Amount appropriated by sundry civil act approved March 3, 1903 ....	400,000.00
	859,820.75
June 30, 1903, amount expended during fiscal year .....	300,758.37
July 1, 1903, balance unexpended .....	559,062.38
July 1, 1903, outstanding liabilities .....	8,742.57
July 1, 1903, balance available .....	550,319.81
July 1, 1903, amount covered by uncompleted contracts.....	139,670.59
Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903:	
For works of improvement.....	\$1,000,000.00
For maintenance of improvement.....	30,000.00
	1,030,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	



## ABSTRACT OF APPROPRIATIONS.

St. Paul to Des Moines Rapids:	
By act approved—	
June 18, 1878.....	\$250,000.00
March 3, 1879.....	100,000.00
June 14, 1880.....	150,000.00
March 3, 1881.....	200,000.00
By act passed August 2, 1882.....	250,000.00
By act approved—	
July 5, 1884 (general improvement).....	250,000.00
July 5, 1884 (applied to harbor, Lake City).....	15,000.00
August 5, 1886.....	382,500.00
Minneapolis to Des Moines Rapids:	
By act of August 11, 1888.....	600,000.00
By act of September 19, 1890.....	500,000.00
Des Moines Rapids to Illinois River:	
By act approved—	
June 18, 1878.....	100,000.00
March 3, 1879.....	40,000.00
June 14, 1880.....	100,000.00
March 3, 1881.....	175,000.00
By act passed August 2, 1882.....	200,000.00
By act approved—	
July 5, 1884.....	200,000.00
August 5, 1886.....	150,000.00
By act of August 11, 1888.....	200,000.00
By act of September 19, 1890.....	165,000.00
Ohio River to Minneapolis, applied to "between Missouri River and Minneapolis:"	
By act approved—	
July 13, 1892.....	600,000.00
March 3, 1893 (sundry civil).....	866,666.67
August 18, 1894 (sundry civil).....	866,666.67
March 2, 1895 (sundry civil).....	866,666.67
Ohio River to St. Paul, applied to "between Missouri River and St. Paul:"	
By act of June 3, 1896.....	200,000.00
By act of June 4, 1897 (sundry civil).....	826,666.67
By act of July 19, 1897 (deficiency).....	200,000.00
By act of July 1, 1898 (sundry civil).....	826,666.67
By act of March 3, 1899 (sundry civil).....	826,666.67
By act of June 6, 1900 (allotment).....	150,000.00
Missouri River to St. Paul:	
By act approved—	
June 13, 1902.....	400,000.00
March 3, 1903 (sundry civil).....	400,000.00
Total.....	11,057,500.02
Less amount transferred to work at Lock and Dam No. 2, Mississippi River, between Minneapolis and St. Paul (act August 18, 1894).....	
	49,877.67
	11,007,622.35

*List of contracts in force July 1, 1903, for improvement work on Mississippi River between mouth of the Missouri and St. Paul, Minn.*

Name and residence of contractor.	Location of work.	Material in place.	Date of approval, of commencement of work, and expiration of contract.
Albert Kirchner, Fountain City, Wis.	Building dams and shore protections Rock Island to Burlington.	<i>Per cubic yard.</i> Rock, 97 cents; brush, 28 cents.	Approved Sept. 20, 1902; work commenced Sept. 20, 1902; contract expires Sept. 20, 1903.
Do.....	Building dams and shore protections Burlington to Hannibal.	Rock, 98 cents; brush, 29 cents.	Approved Sept. 20, 1902; work commenced June 9, 1903; contract expires Sept. 20, 1903.

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## Comparative cost of material, 1902.

[Per cubic yard.]

Locality.	Rock.		Brush.	
	In place.	On United States barges.	In place.	On United States barges.
East shore of Lake Pepin .....		\$0.60		
Minnelska to Winona .....		.64		\$0.135
Winona to Dakota .....				.17
Winona to Victory .....				.17
Trempealeau to Genoa .....				.18
Dakota, vicinity of .....				.18
Wisconsin River to Bellevue .....				.185
Cassville .....		.60		
Spechts Ferry, vicinity of .....		.645		
East Dubuque, vicinity of .....		.67		
Dubuque to below Bellevue .....				.185
Rock Island to Burlington .....	\$0.97		\$0.28	
Dallas, vicinity of .....				.25
Burlington to Hannibal .....	.98		.29	
Nauvoo .....		.49		
Keokuk .....		.53		
Marion City to Hannibal .....				.19
Do .....				.20
Marion City to Hamburg .....				.165
Do .....				.20
Hannibal .....		.57		

NOTE.—The price per cubic yard of rock delivered on barges varied from 49 cents at Nauvoo to 64 cents at Minnelska to Winona. The average cost of rock during the season was 59 cents.  
The price per cubic yard of brush varied from 13½ cents between Minnelska and Winona to 25 cents at Dallas. The average cost of brush during the season was 17 cents.

## United States improvement, upper Mississippi River, St. Paul to Missouri River (Rock Island Rapids not included), 1873-1902.

[Including some desultory work done prior to 1873.]

Total length of dams (1,138,313 feet) .....	miles..	215.6
Total length of shore protections (953,873 feet) .....	do....	180.8
<b>Dams:</b>		
Total rock .....	cubic yards..	3,395,397.2
Total brush .....	do....	4,857,519.4
Total material .....	do....	8,252,916.6
Average per linear foot, rock .....	cubic yards..	2.98
Average per linear foot, brush .....	do....	4.27
Average per linear foot, material .....	do....	7.25
<b>Shore protections:</b>		
Total rock .....	cubic yards..	1,646,191
Total brush .....	do....	1,463,963.6
Total material .....	do....	3,110,154.6
Average per linear foot, rock .....	cubic yards..	1.73
Average per linear foot, brush .....	do....	1.53
Average per linear foot, material .....	do....	3.26
Grand total of material used .....	do....	11,363,081.2

*Subsistence statement, season of 1902.*

District.	Number days sub-sisted.	Cost.		Average per day.	
		Without cooks.	With cooks.	Without cooks.	With cooks.
St. Paul to Winona, including North Pepin pier and dredging at Beef Slough.....	9,470	\$3,476.48	\$4,688.16	\$0.366	\$0.495
Winona to Wisconsin River.....	15,613	4,680.68	5,923.12	.300	.379
Wisconsin River to Bellevue, including surveys and dredging Guttenberg channel.....	7,294	2,236.43	2,900.10	.307	.398
Rock Island Rapids, including dredging at Fulton, dams at Rock River and vicinity, and Illinois and Mississippi Canal.....	4,799	1,499.78	2,179.45	.313	.454
Des Moines Rapids Canal, including dredging at Hamburg and Burlington, and repair work between Burlington and Hannibal.....	5,893	1,616.43	2,433.20	.274	.413
Hannibal to Missouri River.....	6,517	1,604.05	2,052.05	.246	.315
Snag boat.....	5,664	2,134.00	2,827.67	.377	.499
Total.....	55,250	17,247.85	23,003.75	.312	.416

*Fuel statement, season 1902.*

District.	Coal (tons).	Average cost per ton.	Total cost.	Tow, mileage, and average cost for fuel.				Name of boat.	Hours per day.
				Days.	Per day.	Miles.	Per mile.		
St. Paul to Winona.....	796	\$3.78	\$3,012.67	85	\$15.20	3,370	\$0.38	Fury.....	12
				44	8.25	1,746	.21	Emily.....	12
				76	7.16	1,690	.32	Ada.....	12
				63	9.84			Vulcan <sup>a</sup> .....	8
Winona to Wisconsin River.....	506	3.36	1,701.04	96	9.78	4,131	.23	Alert.....	12
				107	7.13	4,657	.16	Elsie.....	12
				95	15.84	4,836	.31	Coal Bluff.....	12
Wisconsin River to Bellevue.....	1,353	2.37	3,203.29	129	2.46	2,625	.12	Louise.....	12
				29	13.82			Dredge 203 <sup>b</sup> .....	8
				43	23.01			do.....	16
				125	3.22	3,608	.11	Ruth.....	12
Rock Island Rapids and Rock Island to Burlington.....	637	2.21	1,407.84	105	4.02	2,724	.16	Mac.....	12
				13	2.22			Ajax <sup>a</sup> .....	8
				21	4.79			Geyser <sup>b</sup> .....	8
				110	2.16			Drill boat 6.....	8
				99	2.16			Drill boat 103.....	8
				140	8.54			Phoenix and Lucia <sup>a</sup> .....	16
Burlington to Hannibal; Des Moines Rapids Canal and Hamburg Bay.....	879	1.88	1,654.19	25	4.30			Phoenix and Iris <sup>a</sup> .....	8
				20	7.09			do.....	8
				23	3.45			Lucia.....	8
				30	1.49			Iris.....	8
Hannibal to Missouri River.....	943	2.18	2,055.87	132	14.49	7,524	.25	Vixen.....	24
Snag boat.....	1,146	2.42	2,773.01	212	13.08	6,555	.42	Mackenzie.....	12
Total.....	6,260	2.53	15,807.91						

<sup>a</sup> Dipper dredge.<sup>b</sup> Pump dredge.

## REPORT OF MR. J. D. DUSHANE, ASSISTANT ENGINEER.

UNITED STATES ENGINEER OFFICE,  
St. Paul, Minn., January 16, 1903.

MAJOR: I have the honor to submit the following report of operations for improving the Mississippi River between St. Paul and Winona, the division in my local charge, for the calendar year 1902.

## ST. PAUL TO WINONA.

The work of improvement was continued under project approved July 30, 1902, by hired labor and use of Government plant, towboats *Fury* and *Emily* doing the towing. Materials were purchased under emergency contracts, at the following prices per cubic yard, delivered on United States barges: For riprap rock, 64 cents; for brush, 13½ cents.

# 1476 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

*Building dams and shore protections.*—Operations for the season were begun August 4, in the vicinity of Wilds Landing (miles 113–114, from Omaha bridge, St. Paul). Here a large bar had formed in midstream. In order to avoid forcing a great part of this sand through the improved river below, the provisional project was modified so as to carry the channel down the right bank instead of crossing to the head of Island 69. This necessitated dredging out 200 feet of the outer end of Dam 30 (sheet 17 *a*), the extension of two dams, and the building of one closing and four wing dams. Dam 56 (sheet 17) was extended 75 feet. Dam 48 (sheet 18) was raised and extended 325 feet. Dam 57 (sheet 17) was built from the left bank below Dam 56. Dams 58 and 59 (sheet 17) were built from Island 69. Closing Dam 86 (sheet 18) was built across a small slough opening into Island 69. Dam 87 (sheet 18) was built from Dam 86. Dams 20, 52, 53, 54, and 55 (sheet 17) were raised to grade. The shore protection on Island 67 was repaired and extended 800 feet upstream. The protection on Island 68 was repaired.

The bar above the mouth of Beef Slough (mile 87) having become troublesome during the latter part of August, a part of the fleet was moved there, and Dam 59 (sheet 14), an emergency dam, was built from the foot of Island 35. This dam, in connection with the dredging by the *Vulcan*, soon made a good opening through the bar.

The fleet was moved on September 11 to Fountain City (miles 109–110), where work was continued. Closing Dam 60 (sheet 17) was built across the head of Pap chute. Dam 61 was built from the right bank above Pap chute. Dams 62 and 63 were built from Dam 60. Dams 64 and 65 were built from the left bank, and Dam 66 from Island 62, opposite the head of Pap chute. Island 63 was protected around the head and along the channel side for a distance of 2,500 feet.

Work was discontinued November 13 and the fleet placed in Fountain City Bay. Further details are given in the following list of works and financial statements.

*List of works constructed and repaired and of materials used during the season of 1905 between St. Paul and Winona.*

Designation.	Dimensions.		Material.	
	Length.	Height above low water 1864.	Rock.	Brush.
	<i>Feet.</i>	<i>Feet.</i>	<i>Cubic yards.</i>	<i>Cubic yards.</i>
Sheet 14: Dam 59, emergency.....	525	3	469.8	1,656
Sheet 17:				
Dam 20, raised .....		4	189.2	
Dam 52, raised .....		4	149	
Dam 53, raised .....		4	301.1	
Dam 54, raised .....		4	97.7	
Dam 55, raised .....		4	89.8	
Dam 56, extended.....	75	4	179.6	401.5
Dam 57.....	435	4	657.9	1,055.5
Dam 58.....	275	4	218	370.2
Dam 59.....	275	4	932	1,893.8
Dam 60.....	1,760	4	2,964.8	4,689
Dam 61.....	380	4	1,083.9	2,271.6
Dam 62.....	415	4	829.5	2,386.2
Dam 63.....	240	4	609.7	1,258.6
Dam 64.....	250	4	716.7	1,602.3
Dam 65.....	750	4	945.9	2,213.1
Dam 66.....	545	4	912.7	1,772.8
Shore protection on head and upper end of Island 63.	2,500	9	4,816.6	4,634.1
Shore protection, Island 67, repaired .....			546.3	
Shore protection, Island 67, extended .....	800	6 to 8	1,140.2	1,064.6
Shore protection, Island 68, repaired .....			95.4	
Sheet 18:				
Dam 48, raised .....		4	426.5	654.3
Dam 48, extended.....	325	4	470.3	908.2
Dam 86.....	115	4	422.2	331.7
Dam 87.....	520	4	1,368.3	2,697.5
Total.....			20,633.1	31,861

*a* Sheet numbers are those of general maps, survey 1878–79.

*Financial statement for work of building dams and shore protections between St. Paul and Winona for the calendar year 1902.*

Amount expended in the field .....	\$33, 970. 25
Add for general superintendence and office expenses.....	2, 126. 52
Add for use and deterioration of plant .....	2, 639. 78
<b>Total .....</b>	<b>38, 736. 55</b>
Material put in place:	
Rock .....	cubic yards.. 20, 633. 1
Brush .....	do..... 31, 861
<b>Total .....</b>	<b>do..... 52, 494. 1</b>
Average cost per cubic yard:	
On barges.....	\$0. 315
For towing .....	. 142
For putting in .....	. 190
For general superintendence and office expenses.....	. 040
For plant.....	. 050
<b>Average cost per cubic yard in place.....</b>	<b>. 737</b>

## HARBOR OF REFUGE AT PEPIN, WIS.

Under special allotment of \$14,000 from appropriation of June 13, 1902, for "the construction of a harbor of refuge on the east shore of Lake Pepin," operations were begun September 16 on a pier at Pepin, Wis. (mile 74).

It was proposed to construct a pier 1,000 feet in length, from the point near the foot of Dunn street. An examination of the proposed site, made in August, 1902, showed a greater depth of water than the survey on which the estimate was based; this increased depth nearly doubled the quantity of material that would be required for the pier as proposed. It was, therefore, decided to change the location of the pier, and a site was selected near the foot of Lake street, about 1,300 feet farther upstream. The center line of the pier is 50 feet west of the westerly line of Lake street produced in a southerly direction, and parallel therewith. The depth on this line is about 5 feet below low water, excepting 200 feet at the outer end, where it is about 15 feet.

The work was performed by hired labor and use of Government plant. Towboat *Ada* acted as tender to the dredge *Vulcan*, which was used for supplying sand and gravel for the pier. Eight barges were hired for this work, at a rate of \$75 per month each. Riprap rock was purchased under emergency contract at 60 cents per cubic yard delivered on United States barges.

During the season 453 feet of the pier was completed, 50 feet additional above water was partly finished, and 150 feet under water was begun. The pier is made of sand and gravel, with a heavy covering of riprap rock. The sand and gravel were mostly dredged from the lake bed in the harbor; these were put into place by dump boats for the foundation, and for the pier above water by casting with the dredge and by scraping and wheeling from barges. The pier has a width of 10 feet on top. The top of pier is 12 feet above low water of 1864. The side slopes are 1 vertical to 2 horizontal. The sides are covered with riprap rock carefully laid up, 3 feet thick at the toe of the slope and decreasing to 18 inches in thickness at the top; the top of the embankment is covered with 18 inches of rock. The materials put in place are 9,070 cubic yards of sand and gravel and 3,128 cubic yards of rock. Including \$1,570.92 plant charge, this work cost \$10,992.70.

The dredge *Vulcan* was used from September 16 to October 29, much time being lost on account of breaking machinery. Towboat *Ada* and barges were taken to Fountain City Bay November 12 and laid up for the winter. Operations for the season were suspended November 15.

## REMOVING BAR AT FOUNTAIN CITY, WIS.

Under a special allotment of \$1,500 from appropriation of June 13, 1902, for "removing the bar in the Mississippi River at the mouth of Fountain City Bay at the foot of North street, Fountain City, Wis.," work was begun November 1, 1902. After being released from work at Pepin, the dredge *Vulcan*, attended by towboat *Emily*, began the removal of this bar. Dredging was discontinued for the season

## 1478 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

November 12, and the dredging outfit was laid up for the winter in Fountain City Bay. The dredged material, consisting of 3,076.1 cubic yards of sand and rock, was used in the construction of dams and shore protections in the vicinity. The cost of this work, including \$212.16 plant charge, was \$749.01.

### IN GENERAL.

Maps of the harbor-line survey at St. Paul, Minn., were completed and descriptions of the harbor lines prepared. After approval by the Secretary of War the harbor lines were located on the ground and monumented.

Surveys were made from Wabasha to Alma (miles 81-90), and from Fountain City to Winona (miles 106-116), also of the harbors of Pepin (mile 74) and Stockholm (mile 67).

At the beginning of the season 28 buoys were placed to mark the ends of dams near the channel.

Very respectfully, your obedient servant,

Maj. C. McD. TOWNSEND,  
*Corps of Engineers.*

J. D. DU SHANE,  
*Assistant Engineer.*

### REPORT OF W. A. THOMPSON, ASSISTANT ENGINEER.

UNITED STATES ENGINEER OFFICE,  
*La Crosse, Wis., January 12, 1903.*

MAJOR: I have the honor to submit the following report of operations for improving the Mississippi River in the division in my local charge for the calendar year ending December 31, 1902.

### WINONA TO WISCONSIN RIVER.

The improvement of this portion of the river by the construction of rock and brush dams and shore protection was carried on by hired labor and use of Government plant, towboat *Alert* and launch *Elbie* doing the towing. The rock used was lime rock, quarried and loaded on United States barges by hired labor and use of Government plant. The brush was purchased in open market, under emergency contract, at 17 and 18 cents per cubic yard on United States barges.

Necessary repairs having been made, a portion of the fleet was placed in commission July 29, 1902, the remaining barges being placed in commission when repaired. Regular construction work was commenced August 2. The unusual scarcity of labor greatly impeded the progress of the work throughout the season. This scarcity of men was felt most in the Government quarry at Lamaille, which was enabled to run but eight hours a day during most of the season. For economical working it should run at least sixteen hours a day. When running a double crew (sixteen hours) each crew was too small to get out rock enough to run the skips and cable hoist to anything like their full capacity. The resulting scarcity of rock was felt by the constructing crews.

During the season, from August 2 to November 8, improvements and repairs were made in the vicinity of Dakota and Dresbach. The river in this vicinity was in very bad shape. Owing to the lack of appropriations last season no work was done here and the previous works were left in a very unfinished condition. The channel had become so filled in with sand that by midsummer this place threatened to become the head of navigation. However, as soon as funds were available work was pushed in this locality, with the result of soon cleaning out the channel so as to give no further hindrance to navigation.

The first work done was the building of Wing Dam 44 (mile 135) from right bank, 1,340 feet above Closing Dam 42. This dam confined the water over the worst bar and the increased velocity of current soon carried the sand downstream and the most of it out of the way, so that it gave little further hindrance to navigation. The other work done was as follows: Wing Dams 45 and 47 (mile 135), and 48 (mile 136), were built from left bank, 920, 1,710, and 2,480 feet, respectively, below old Wing Dam 35. Wing Dam 46 (mile 135) was built from right bank, 1,190 feet above Wing Dam 44. Old Wing Dam 38, from near foot of island, and Wing Dams 42 and 43, from Island 92 (mile 135), were repaired and extended. Old Wing Dams 34 and 35 (mile 135) were repaired. Closing Dam 6 (mile 136), from left bank to head of Island 93, was raised and repaired. All of the west side of Island 93 was protected. Wing Dams 49 and 51 (mile 136) were partially built from right bank, 2,590 and 3,520 feet, respectively, below old Closing Dam 42. Wing Dam 50 (mile 136) was built from west side of Island 94, 440 feet below line of old Closing Dam 37. The head of Island 94 was protected. Old Closing Dam 37, from left bank of Island 94,



AND





was repaired. Wing Dam 53 (mile 137), from right bank, 50 feet below line of old Wing Dam 39, was partially built. Wing Dam 54 (mile 137), from head of Island 96, was commenced, but not completed. Wing Dam 52 (mile 137), from left bank, 825 feet below old Wing Dam 40, commenced, but not completed. Shore protection on left bank, commencing 300 feet below Wing Dam 52, was begun. Proposed length, 2,600 feet. Seven hundred feet of mat 40 feet wide was sunk.

All of the above work is in sheet 20.

Operations were suspended November 8, and the fleet was placed in winter quarters in Fountain City Bay and Black River at La Crosse.

Further details as to length and height and material used are given in the following table:

*List of works constructed and repaired and of materials used during the season of 1902, Winona to Wisconsin River.*

Designation.	Dimensions.		Material.	
	Length.	Height above low water 1864.	Rock.	Brush.
Sheet 20 (miles 135-137):	<i>Feet.</i>	<i>Feet.</i>	<i>Cubic yds.</i>	<i>Cubic yds.</i>
Wing Dam 34, repaired .....		4	1,205.8	2,171.1
Wing Dam 35, repaired .....		4	197.5	337.6
Wing Dam 38, extended .....	860	4	1,015.6	2,554.3
Wing Dam 38, repaired .....		4	328.6	856.2
Wing Dam 42, extended .....	50	4	195.7	310.9
Wing Dam 43, extended .....	100	4	838.6	1,707.2
Wing Dam 43, repaired .....		4	209.6	613
Wing Dam 44 .....	875	4	2,028.9	4,225.2
Wing Dam 45 .....	390	4	1,222.9	3,302.3
Wing Dam 46 .....	340	4	723.2	1,471.1
Wing Dam 47 .....	215	4	831.3	2,226.7
Closing Dam 6, repaired .....		4	2,263.7	3,926.5
Closing Dam 37, repaired .....		4	367.6	468.1
Wing Dam 48 .....	265	4	1,924	4,705.8
Wing Dam 49 .....	770	4	1,678.8	6,447.4
Wing Dam 50 .....	290	4	959.7	2,514.3
Wing Dam 51 .....	380	4	1,781.3	5,868.3
Shore protection, Island 93 .....	1,250	6	2,156.3	1,415.3
Shore protection, Island 94 .....	245	9	363.5	385
Wing Dam 52, not completed .....	420	4	1,041	2,808.2
Wing Dam 53 .....	630	4	1,594	4,929.3
Wing Dam 54 .....	405	4	665.4	2,316.4
Shore protection, left bank below Dam 52, not completed .....	700		305.8	1,673.5
Total .....			23,898.3	56,733.7

*Financial statement for work between Winona and Wisconsin River performed by hired labor during season of 1902.*

Amount expended in field during calendar year 1902 (from distribution sheets) .....	\$43,592.99
Add quota of general superintendence and office expenses .....	2,728.93
Add for use and deterioration of plant, quarry .....	\$4,054.73
Add for use and deterioration of plant, building dams, etc. ....	4,173.00
	<u>8,227.73</u>

Total .....	<u>54,549.65</u>
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Material put in works:

Rock .....	cubic yards..	23,898.3
Brush .....	do....	56,733.7
Total .....	do....	<u>80,632</u>

Average cost per cubic yard:

On barges .....	\$0.318
For towing .....	.081
For putting in place .....	.142
For general superintendence and office expenses .....	.034
For plant .....	.102

Average cost per cubic yard in place .....	<u>.677</u>
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1480 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

*Quarrying rock at Lamoille (mile 125).*—Work was performed by hired labor and use of Government plant, the cable hoist being employed in transporting rock from quarry on top of bluff, 500 feet above water surface, to barges. Rand and Ingersoll-Sargeant steam drills were used for drilling. Before commencing the work of quarrying and loading rock general repairs were made to the plant and everything put in good condition for economical work. Operations were commenced August 2, 1902, with a single crew, working eight hours per day, and continued until August 25, when two shifts of men were employed and the quarry was operated on a sixteen-hour basis until October 15, when the impossibility of getting sufficient labor for two shifts forced the quarry to run with one crew until November 8, the close of the season. The scarcity of labor throughout the season prevented the plant from running to its full capacity, even though the wages paid for labor were 25 per cent more than ever paid before in the quarry. This, together with the short season and the fixed charges, such as plant and rental for two years, and general superintendence, altogether, amounting to about 40 per cent of the money actually expended, makes the cost per cubic yard appear large.

During season of 1902, 24,693 cubic yards rock was taken from this quarry and used in building dams and shore protections and for levee improvement at La Crosse Harbor (794.7 cubic yards).

SURVEYS AND EXAMINATIONS.

In July, before construction work was begun, a survey, with soundings, was made of the river from head of Island 91 (mile 134) to foot of Island 96 (mile 139). The notes were platted, and on the map the project for the season's work was laid out and estimates made of the proposed work in the locality. In November, just before close of the season's work, a survey, with soundings, was made from Winona wagon bridge to Lamoille station, in order to determine upon a project for work in this locality.

CONSTRUCTION OF AND REPAIRS TO PLANT.

Plant repairs were carried on, by hired labor and use of Government plant at Fountain City boat yard, from March 26 to December 31. During this period repairs to plant belonging to the district St. Paul to Winona were made, in addition to that used in this district. A quarter boat was built for the crew of hydraulic dredge No. 203. The hull of this boat is 60 feet long, 18 feet wide, and 3½ feet high. The cabin is 48 feet long, 18 feet wide, and 8 feet high, divided into eight rooms. Total cost, \$1,420.99.

Very respectfully, your obedient servant,

W. A. THOMPSON,  
*Assistant Engineer.*

Maj. C. McD. TOWNSEND,  
*Corps of Engineers.*

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REPORT OF MR. S. EDWARDS, ASSISTANT ENGINEER.

UNITED STATES ENGINEER OFFICE,  
*Rock Island, Ill., January 12, 1903.*

MAJOR: I have the honor to submit the following report of operations for improvement of the Mississippi River between the Wisconsin River and Bellevue, the division in my local charge, for calendar year ending December 31, 1902:

DREDGING GUTTENBERG CHANNEL.

U. S. towboat *Alert* arrived at Guttenberg channel August 1, 1902, with hydraulic dredge No. 203, returning to La Crosse at once, after which towboat *Louise* tended the dredge. The dredging consisted of three cuts near head of the channel, made as follows: In mile 225, 1,400 feet long; in mile 227, 1,600 feet, and in mile 228, 2,000 feet. The width of the cuts was from 30 to 60 feet, with an average depth of 7 feet below low water. The river at this point is divided by islands into two channels, Cassville Slough and Guttenberg channel, the former of which—although sufficiently deep—is much too crooked for raft navigation, and the latter has many shoal crossings. It is possible that Guttenberg channel will be adopted as the only one in the near future; but the closing of Cassville Slough should be postponed until, by dredging or contraction works, Guttenberg channel has been so improved that there

will be little danger to navigation at a low stage. The cuts mentioned were somewhat in the nature of an experiment, and were made through three different bars. At the close of operations they had not filled up to any great extent; a good current (much stronger than before dredging) was easily noticeable, and the towboat *Coal Bluff*, with a tow 100 feet wide, had no difficulty in following the channel at a stage of 1.7 above low water.

Dredging was discontinued on October 27, and the dredge was then laid up for the winter in Dubuque Ice Harbor.

*Financial statement for dredging Guttenberg channel, season of 1902.*

Amount expended in field .....	\$6,387.78
Add quota of general superintendence and office expenses .....	399.89
Add plant charges.....	1,789.71
<b>Total .....</b>	<b>8,577.38</b>
Sand removed (estimated) .....	cubic yards.. 108,000
Cost per cubic yard.....	\$0.079

DAMS AND SHORE PROTECTION.

Construction work was carried on, by hired labor and Government plant, towboat *Coal Bluff* doing the towing. Material was purchased in open market according to existing regulations, and was furnished on United States barges at the following prices: Rock, 54½, 57, and 60 cents per cubic yard; brush, 18½ cents per cubic yard. Operations began August 9 and closed November 15, when the fleet was laid up in Dubuque Ice Harbor.

The work consisted in repairing Closing Dam 11 (sheet 39, mile 289), opposite Bellevue, used as a ferry dike, and in building 2,200 feet of revetment on Illinois shore below foot of Bellevue Slough (sheet 39, mile 286). At Stone Slough (sheet 38, miles 281-282), two wing dams (3 and 4) were built, respectively 950 and 1,140 feet long, and also 900 linear feet of shore protection on Island 241. At Deadmans bar (sheet 38, miles 276-277) six wing dams were built (5, 6, 7, 8, 9, and 10), respectively 700, 480, 370, 270, 170, and 630 feet long, and 3,000 feet of bank on Island 235 was protected.

The total linear feet of wing dams built during the season was 4,710, and of shore protection 6,100.

*List of works constructed and repaired and of material used during season of 1902, between Wisconsin River and Bellevue.*

Designation.	Dimensions.		Material.	
	Length.	Height above low water, 1864.	Rock.	Brush.
Sheet 38 (miles 276-283):	<i>Feet.</i>	<i>Feet.</i>	<i>Cubic yds.</i>	<i>Cubic yds.</i>
Wing Dam 3 .....	950	4	2,024.9	3,591.2
Wing Dam 4 .....	1,140	4	2,707.7	5,572.7
Wing Dam 5 .....	700	4	1,358.8	2,855.9
Wing Dam 6 .....	480	4	1,302	2,465.5
Wing Dam 7 .....	870	5	639.3	1,886.7
Wing Dam 8 .....	270	5	895.5	2,250.9
Wing Dam 9 .....	170	4.5	860.2	1,415.6
Wing Dam 10 (not completed) .....	630	3	333.5	1,739
Shore protection, Island 235 (not completed) .....	3,000	4 to 12	3,377.5	5,751
Shore protection, Island 241, extended .....	900	11 to 15	1,285.2	1,835.8
Sheet 39 (miles 283-289):				
Closing Dam 11 (ferry dike), repaired .....		6	256	614.7
Shore protection, Illinois shore, foot of Bellevue Slough .....	2,200	9 to 13	3,092.4	4,493.9
<b>Total .....</b>			<b>18,138</b>	<b>34,471.9</b>

# 1482 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

*Financial statement for work of building dams and shore protections between Wisconsin River and Bellevue in 1902.*

Amount expended in field during calendar year .....	\$30,700.15
Add quota of general superintendence and office expenses.....	1,921.82
Add for use and deterioration of plant .....	4,963.64
<b>Total .....</b>	<b>37,585.61</b>
<b>Material put in works:</b>	
Rock .....	18,133
Brush .....	34,471.9
<b>Total .....</b>	<b>52,604.9</b>
<b>Average cost per cubic yard:</b>	
On barges.....	\$0.318
For towing .....	.089
For putting in place .....	.153
For general superintendence and office expenses.....	.037
For plant .....	.092
<b>Total .....</b>	<b>.689</b>

The cost of the repairs to the ferry dike (Dam 11, sheet 39) was \$649.87.

Surveys were made in July and August at Guttentberg channel (miles 225-235); at Spechts ferry (miles 252-254); below Dubuque Bridge (miles 265-266); at Deadmans bar (miles 276-278), and at Stone Slough (miles 280-283). Total length of surveys, 20 miles. Notes were plotted in the field and the maps were forwarded to the office promptly.

## IN GENERAL.

The work during the whole season was greatly delayed and the cost increased by the scarcity of labor, the various material contractors running behind in their quota of delivery for the same reason. Coal was difficult to get, the round trips from coal yards to works varying from 100 to 200 miles, increasing cost of towing; the cost of subsistence was high, and 25 per cent more than in former years was paid to laborers. Owing to the late commencement of operations it was impracticable to do any work at Spechts Ferry (miles 252-254). This part of the river was as difficult to navigate as the localities at which work was performed, and it is suggested that the first work the coming season be at Spechts Ferry (mile 252).

I was ably assisted throughout the season by Mr. G. J. Benson, recorder.

Very respectfully, your obedient servant,

S. EDWARDS,  
*Assistant Engineer.*

Maj. C. McD. TOWNSEND,  
*Corps of Engineers.*

## REPORT OF MR. J. C. M'ELHERNE, ASSISTANT ENGINEER.

UNITED STATES ENGINEER OFFICE,  
*Rock Island, Ill., January 19, 1903.*

MAJOR: I have the honor to submit the following report of operations for the improvement of the Mississippi River in the division in my local charge for the calendar year ending December 31, 1902.

### IMPROVING ROCK ISLAND RAPIDS.

The section of river comprising the Rock Island Rapids extends from the three hundred and forty-eighth mile to the three hundred and sixty-fourth mile from St. Paul, Minn.

The part of the fleet required for active service having been repaired, operations began on August 3, 1902.

*Dams.*—Trailing Dam 9½ (sheet 47), on right side of channel at Duck Creek chain, which had been injured by floods, received nominal repairs, having been raised and widened 10 feet for a distance of 60 feet.

*Rock excavation.*—Two steam drill boats, with single crews, were employed. Drill boat No. 6 worked from August 4 to end of month disrupting the remainder of high

left shoulder of Sycamore chain. The rock in this ledge was hard and irregular in height, the average elevation being 1.95 feet above grade. The area covered was 6,323 square feet. The boat was then transferred to the upper right shoulder of Campbell's chain and continued working thereon until close of season, November 12. The reef worked over contained pockets of fire clay and in places deep beds of gravel, which varied in height from 0.3 to 3.1 feet above grade. The area covered was 42,736 square feet. Drill boat No. 103 between August 6 and September 1 finished blasting high rock patch in right side of channel at Moline Crossing. The rock here was unusually hard and ranged from 0.4 to 2.3 feet above grade over an area of 6,334 square feet. Between the latter date and September 10 the boat blew up the rock patch in upper end of Winnebago chain. This obstructive section of bottom was also quite hard and uneven. It averaged 2.4 feet above grade and extended over an area of 3,872 square feet. This outfit was then engaged until work was suspended, November 11, at blasting on upper end of right shoulder of Campbell's chain. Rock of medium hardness, with deposits of fire clay under scattering banks of gravel, was encountered. The range of the ledge above grade varied from 0.5 to 3.7 feet, and the area worked over was 28,832 square feet.

Work for the season was discontinued on November 12, and the fleet was immediately afterwards laid up for the winter in the harbor of the Illinois and Mississippi Canal.

Mr. J. B. Gordon, overseer, part of the time, and J. B. Corken, recorder, performed their duties in a very satisfactory manner.

*Details of operations, season of 1902.*

*Towboat Ruth:*

Hours in use under steam.....	924
Miles run light.....	1,500
Miles run towing.....	1,090
Miles run, total.....	2,590

*Drill boat No. 6:*

Hours worked.....	658
Hours lost, owing to rafts, accidents, storms, etc.....	0
Holes drilled.....	1,552
Holes blasted.....	1,483
Linear feet of holes drilled.....	7,112.2
Range poles set in rock bottom.....	62
Ringbolts set.....	7
Water gauges set.....	2
Solid cubic yards rock blasted.....	3,373
Pounds of dynamite used.....	3,698

*Drill boat No. 103:*

Hours worked.....	650
Hours lost, owing to accidents, rafts, storms, etc.....	0
Holes drilled.....	1,331
Holes blasted.....	1,286
Linear feet of holes drilled.....	5,986.1
Range poles set in rock bottom.....	39
Ringbolts set.....	4
Water gauges set.....	2
Solid cubic yards rock blasted.....	2,828.2
Pounds of dynamite used.....	3,201

*Summary of total amounts of material.*

Solid cubic yards of rock, blasted only..... 6,201.2

*Cost of rock excavation, including charge for use and deterioration of plant.*

Designation.	Rock excavation, solid cubic yards.	Total cost.	Average cost per solid cubic yard.
Upper left shoulder of Sycamore chain, blasted only.....	424.1	.....	.....
Upper right shoulder of Campbell's chain, blasted only.....	5,076.1	.....	.....
Winnebago chain, blasted only.....	387.4	.....	.....
Moline Crossing, blasted only.....	313.6	.....	.....
Total.....	6,201.2	\$16,663.47	\$2.687

# 1484 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

## *Financial statement for improvement of Rock Island Rapids for season of 1902.*

Amount expended in field .....	\$13,915.45
Add quota of general superintendence and office expenses.....	871.08
Add for use and deterioration of plant .....	1,876.94
<b>Total .....</b>	<b>18,663.47</b>

### BUOYS ON ROCK ISLAND RAPIDS.

The entire lot of buoys in storage were thoroughly repaired and painted, several new ones prepared, and those needed were reset between April 13 and 25, 1902. At the request of navigators, 6 additional buoys were established in the following localities: No. 2½, midway down left side of upper chain; No. 17½, on the right at foot of Winnebago chain; No. 24, at left side of Moline chain, one-third of its length below head; No. 24½, on the right side of channel above Stubbs eddy; No. 25½, on the right well below foot of lower chain, and No. 26½, on the right at site of old Chicago, Rock Island and Pacific Railway bridge. Some buoys torn from their fastenings by boats were afterwards replaced. Toward the close of the season the ranges, being greatly decayed, were mostly renewed, and on November 11 and 12 the buoys were taken up and safely stored with the fleet for the winter.

Total number of buoys in the system, 42; cost of buoyage for the season, \$665.

Very respectfully, your obedient servant,

Maj. C. McD. TOWNSEND,  
Corps of Engineers.

J. C. McELHERNE,  
Assistant Engineer.

### REPORT OF MR. C. W. DURHAM, ASSISTANT ENGINEER.

UNITED STATES ENGINEER OFFICE,  
Rock Island, Ill., January 9, 1903.

MAJOR: I have the honor to submit the following report of operations for improvement of the Mississippi River between Rock Island (mile 363) and Burlington (mile 442), the division in my local charge, for the calendar year ending December 31, 1902.

### ROCK ISLAND TO BURLINGTON.

Under project approved July 30, 1902, and allotment of \$35,000 from appropriation of June 13, 1902, and under contract expiring September 20, 1903, Contractor Albert Kirchner commenced operations September 20, 1902, and closed for the winter on November 8, laying his fleet up in New Boston Bay (mile 412). The prices paid under this contract are: 97 cents per cubic yard for rock, and 28 cents for brush. The work done during the season of 1902 was the construction of two wing dams opposite Burlington (mile 442); of 800 linear feet of shore protection on Moores Towhead, and repairs to Dam 16 connecting Moores Towhead with Rush Island, and of the upper 800 feet of shore protection on the towhead (mile 441). The shore protection on Illinois shore opposite Island 360, below Keithsburg (mile 422) was extended 635 feet. The apron mat for this shore protection is 30 feet wide; for that on Moores Towhead, 20 feet.

This work was in local charge of R. Monroe, junior engineer, whose duties were well performed.

*List of works constructed and of materials used during the season of 1902, under contract with Albert Kirchner, between Rock Island and Burlington.*

Designation.	Dimensions.		Material.	
	Length.	Height above low water, 1864.	Rock.	Brush.
Sheet 55 (miles 416-423):				
Shore protection, Illinois shore opposite Island 360...	Feet. 635	Feet. 10	Cubicyards. 1,177.1	Cubicyards. 1,374
Sheet 58 (miles 436-444):				
Closing Dam 16, repairs.....		4	1,486.8	1,957.8
Shore protection on Moores Towhead, repairs.....		6	1,007.1	1,008.9
Shore protection on Moores Towhead, extension.....	800	6	743.8	864
Wing Dam 17 .....	870	4	2,515.8	5,039.4
Wing Dam 18 .....	420	4	2,591.2	4,142.8
<b>Total.....</b>			<b>9,521.8</b>	<b>14,386.9</b>

*Financial statement for work performed in 1902, between Rock Island and Burlington, under contract with Albert Kirchner.*

Amount paid contractor .....	\$11,937.63
Retained percentage on contract .....	1,326.40
Cost of local inspection, etc .....	649.76
Quota of general superintendence and office expenses .....	871.02
Add for use and deterioration of plant .....	28.08
<b>Total .....</b>	<b>14,812.89</b>
<b>Material put in works:</b>	
Rock .....	cubic yards.. 9,521.8
Brush .....	do..... 14,386.9
<b>Total .....</b>	<b>do..... 23,908.7</b>
Average cost per cubic yard in place .....	\$0.620
Average cost per cubic yard for inspection .....	.027

ROCK ISLAND TO NEW BOSTON.

In March, 1902, an arrangement was made with Mr. T. B. Davis, of Rock Island, Ill., by which he agreed to furnish, for building dams, rock and gravel dredged from Sylvan Slough in return for the loan of a dredging plant. U. S. dredge *Ajax* and two dump boats were turned over to Mr. Davis on March 29, but, as several preliminary cuts had to be made, no material was placed in the dams until May 6. In June, dump 7 and towboat *Ruth* were added to the plant, the latter until August 2 only. In September, October, and a part of November, quarterboat 45, officeboat 48, towboat *Mac*, and five barges were also used. On November 15 operations were discontinued; the fleet was returned to the United States and laid up for the winter in the Illinois and Mississippi Canal. In addition to the work performed for general improvement of the Mississippi River, considerable repairs were made to the dams at mouth of Rock River, adjuncts of the canal, and for this work canal funds were used. I have, however, for convenience, combined all the work in one report.

Three wing dams were built from the Illinois shore above Horse Island (mile 368), which were not fully completed, the low stage of water preventing trimming up and raising to grade of portions of each of them. The aggregate length of the three dams is 4,225 feet. Dam 13, closing Horse Island Chute, was raised to 6 feet above low water, with a crest about 8½ feet wide. Rock River dams *a*, *b*, and *c* were all repaired, and the latter was extended 210 feet.

*List of works constructed and quantities of dredged material used during season of 1902 between Rock Island and New Boston.*

Designation.	Dimensions.		Material.
	Length.	Height above low water, 1864.	Rock and gravel.
Sheet 48 (miles 363-370):	<i>Feet.</i>	<i>Feet.</i>	<i>Cu. yds.</i>
Wing Dam 29, not completed .....	1,100	4	8,777.5
Wing Dam 30, not completed .....	1,450	4	4,940.2
Wing Dam 31, not completed .....	1,675	4	7,739
Closing Dam 13, raised .....		6	1,423.4
Wing Dam <i>a</i> (Rock River), repaired .....		3	55.1
Wing Dam <i>b</i> (Rock River), repaired .....		3	393.4
Wing Dam <i>c</i> (Rock River), extended .....	210	4	5,456.5
Closing Dam 8½, raised and repaired .....		6	196
Wing Dam 32 (head Smiths Island), begun .....			53.2
Wing Dam 33 (Credit Island), begun .....			48
<b>Total .....</b>			<b>29,062.3</b>

NOTE.—Of the material, 25,096.8 cubic yards was dumped from scows and 3,985.5 cubic yards shoveled from flats.

There is a tolerably close agreement between the amounts actually put in Dams 29, 30, and 31 and the original estimates, indicating comparatively little waste in dumping material. There were used in the Rock River work 5,906 cubic yards and in the general improvement work 23,177.3 cubic yards.

# 1486 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

*Financial statement for work between Rock Island and New Boston carried out in 1902 under agreement with T. B. Davis and in part by hired labor.*

Amount expended in the field during progress of work:		
Missouri River to Minneapolis .....	\$2,510.03	
Illinois and Mississippi Canal .....	754.77	
		\$3,264.80
Add for general superintendence and office expences .....		157.12
Add for use and deterioration of plant .....		4,106.31
Total .....		7,528.23
Material put in place (coarse gravel, with clay and bowlders) ..cu. yds..	29,082.3	
Average cost per cubic yard.....		\$0.258

Had the construction and repair of dams above mentioned been performed by contract, using brush and rock instead of gravel, it would have cost, at the very low prices paid in this district in 1902, as follows:

9,694 cubic yards rock, at 97 cents .....	\$9,403.18
19,388 cubic yards brush, at 28 cents.....	5,428.64
Add for inspection, superintendence, and office expenses, 10 per cent ...	1,483.18
Total .....	16,315.00

A saving to the United States of \$8,786.77 on the work performed in 1902, by the materials and methods used, as compared with contract figures, is shown to have been made. At the lowest contract figure obtained by this office, 50 cents per cubic yard for dredging gravel and placing the same, the work by Mr. Davis, conjointly with hired labor, would have cost \$14,541.15.

The above-mentioned work was superintended by A. J. Stibolt, junior engineer, whose duties were well performed.

I append a small-scale map showing the project for improvement in the vicinity of Horse Island (mile 369). As the bottom is generally of rock, the dams were located with the object of reducing rock excavation to a minimum. The dams were built in the order of the numbers and have a crest elevation of 4 feet above low water, except No. 13, which is 6 feet.

## FLINT CREEK TO IOWA RIVER LEVEE.

[Miles 411-440 on the upper Mississippi River.]

There was no construction or repair work carried on during the year. An inspection made in November, 1902, showed the levee and its adjuncts in good condition, with trifling exceptions. A portion of the shore protection along the Iowa River in sections 3, 4, 5, and 6 should be carried to the top of the bank, it having been built only to a 7-foot stage. Preparations are now being made to perform this work, there being a small balance (\$3,021.12) available. The total amount appropriated for this levee, which is 35½ miles in length, is \$300,000, and the approved estimate is \$305,000, exclusive of cost of drainage, repair, right of way, shore protection, and levee bank revetment, on which necessary items there has been expended to date \$27,642.99. There are no funds available for the care and maintenance of this levee.

## DAVENPORT HARBOR.

The river and harbor act of June 13, 1902, provides that "The ten thousand dollars heretofore appropriated by the sundry civil act of March third, eighteen hundred and ninety-nine, for the improvement of the Mississippi River at Davenport, Iowa (mile 363), with the further sum of five thousand dollars to be taken from amounts appropriated in this paragraph, shall be applied for the construction of a harbor of refuge from ice at a point at or below the said city of Davenport and other necessary improvements of said harbor."

Some preliminary examinations of the proposed ice-harbor sites have been made, but no project for the work has yet been presented.

## BUOYS.

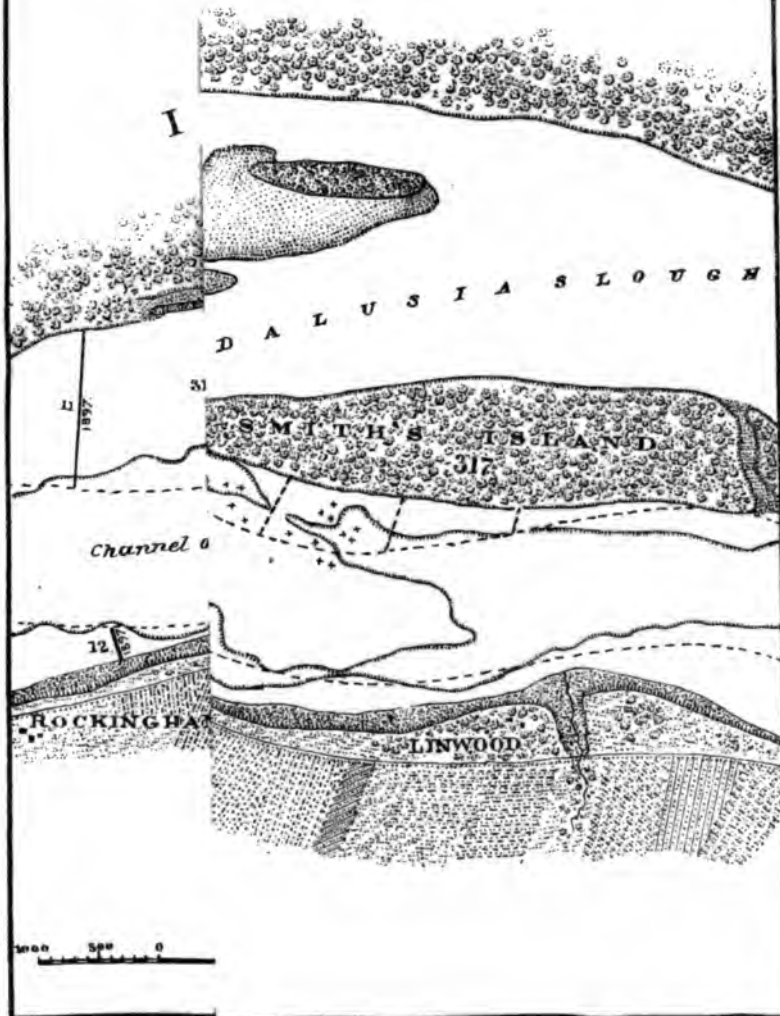
Buoys are placed each season to mark the location of the ends of certain dams that are dangerous to raft navigation at stages when the crest of the dam is covered by water to a depth of less than 3½ feet. The regular buoys in my district are 13 in number.



Showing 7

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ANDREW B. GRAHAM PHOTO LITHO W.A.

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1. The first part of the document is a list of names and addresses of the members of the committee.

2.

3.

## SURVEYS.

There were made during the season examinations of the river at Rockingham Slough (mile 367), below Horse Island (miles 369-370), vicinity of Johnsons Island (miles 422-424), and at Burlington (miles 439-441), and maps of same have been plotted.

## IN GENERAL.

September 17-19, 1902, a profile of center line of channel from Burlington to Rock Island was made with the sounding machine in tow of the snag boat *Col. A. Mackenzie*. There are given below depths on the shoalest bars between the points named and the stage of water at the time of making the soundings. The work of the sounding machine was satisfactory in this district.

*Stage of water 2.2.*—Above Burlington (mile 440), 5.7; Otter Island (mile 439), 5; head of Drew Chute (mile 435), 6; below Dasher Island (mile 434), 4.5; below Oquawka (mile 426), 5.9; shoulder of Johnsons Island (mile 424), 5.

*Stage of water 2.*—Head of Johnsons Island (mile 424), 4.5; below Keithsburg (mile 419), 5.5; Turkey Island (mile 407), 5.7; below Illinois Chute (mile 402), 5; foot of Muscatine Prairie (mile 397), 4.4; below Muscatine (mile 391), 4.9; foot of Hershey Chute (mile 388), 5.8; below Fairport (mile 383), 5; above Fairport (mile 381), 5; Montpelier (mile 378), 3.9; above Montpelier (mile 376), 5.5; below Buffalo (mile 373), 5.5; above Buffalo (mile 372), 5.5; below Horse Island (mile 370), 5; head of Horse Island (mile 369), 5.5.

The localities most in need of improvement appear to be: Below Horse Island (mile 371), where the channel is congested by sand set in motion by contraction works above, and where it would be well to complete the projected work at an early day; at Montpelier (mile 378), where an extension of the system of dams is required; at foot of Muscatine Prairie (mile 397), a new obstruction, which may be temporary, and at Johnsons Island (mile 424), where work has been commenced and will be continued next season. The following additional work is especially recommended, viz: The protection of the east bank of Turkey Island (mile 406) for about 3,000 linear feet; of the Illinois shore opposite Turkey Island and below about 10,000 linear feet (miles 407-408); of the Illinois shore between New Boston and Keithsburg (mile 416), 3,000 feet, and of the Illinois shore in vicinity of Johnsons Island (miles 422-424), about 10,000 feet. The protection of the Iowa shore below Port Louisas should be extended about 1,500 feet and the old work repaired (miles 404-405). A series of short wings from the Iowa shore above Fairport (mile 381) is desirable to keep the channel away from the flat, rocky shore, and the chute between islands 348 and 349 (mile 402) should be closed to prevent a too great diversion of the channel water.

Very respectfully, your obedient servant,

C. W. DURHAM, *Assistant Engineer.*

Maj. C. McD. TOWNSEND,  
*Corps of Engineers*

## REPORT OF MR. M. MEIGS, U. S. CIVIL ENGINEER.

UNITED STATES ENGINEER OFFICE,  
*Keokuk, Iowa, January 21, 1903.*

MAJOR: I have the honor to submit the following report of operations for improving the Mississippi River in the district under my local charge, extending from Burlington, Iowa, to Hannibal, Mo., for the calendar year 1902.

## BURLINGTON TO HANNIBAL.

In this whole stretch of river (miles 445-540) there was an excellent stage of water the entire season, and no difficulty occurred at any time in maintaining a good channel for navigation. A small flood occurred in the month of July, which reached 15.5 feet at low water at Keokuk. This flood occurring at the ordinary time of low water overflowed the banks of the river and inundated the bottom lands just when the crops were maturing, causing considerable loss wherever the lands were unprotected by levees. The corn was much of it under 3 feet of water, but to the surprise of everyone a great part of this corn matured. This is a new experience in this section, for it has always been held that corn flooded even to the surface of the ground was irretrievably ruined.

No new work was done on this section of the river, though a contract was let September 20, 1902, to Albert Kirchner, covering the whole section.

# 1488 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

Some small repairs were made by hired labor and purchase of material in open market, and Government plant, the steamer *Lucia*, 1 pile driver, and 3 barges being employed.

From September 26 to October 17, 1902, the small plant was employed above the Des Moines rapids repairing Closing Dam 16 (sheet 60), Closing Dam 24, and the shore protection of Closing Dam 7.

Between September 16 and 24 the same small plant was employed in repairing the shore protection at the lower end of Gregory's bend and on the Missouri shore below Alexandria.

Between August 15 and September 15 a small party made a survey of the river from Cottonwood Island (mile 520) to Armstrong Island (mile 536), but on account of high water the results were discarded as of no value.

*List of works repaired by hired labor and of material used during season of 1902 between Burlington and Hannibal.*

Designation.	Height above low water 1864.	Material.		
		Rock.	Brush.	Piling.
Sheet 60 (miles 455 to 460):				
Closing Dam 16, repaired .....	Feet. 2	Cu. yds. 676	95	742
Closing Dam 24, repaired .....		58.4	108.9	
Shore protection at Dam 7, repaired .....		175.1		
Sheet 63 (mile 490): Shore protection below Alexandria, repaired .....	12	160.7		
Sheet 64 (mile 496): Shore protection below Gregory, repaired.	12	321.4		
Total.....		1,391.6	203.9	742

*Financial statement for work of repairs to dams and shore protections between Burlington and Hannibal performed by hired labor during season of 1902.*

Amount expended as per vouchers .....	\$2,027.55
Add quota of general superintendence and office expenses .....	126.95
Add plant charges.....	309.14
	2,463.64
Deduct cost of piling and driving same .....	220.40
Total.....	2,243.24
Material put in work:	
Rock, cubic yards.....	1,391.6
Brush, cubic yards .....	203.9
Total, cubic yards.....	1,595.5
Average cost per cubic yard:	
On barges.....	.472
For towing .....	.256
For putting in place .....	.405
For superintendence and office expenses.....	.079
For plant.....	.194
Total .....	1.406

## WARSAW TO QUINCY LEVEE.

From September 9 to 14 a small force of men with Government plant was at work repairing the cutting bank in Hackley Chute, between stations 236 and 245 (mile 494). The bank was sloped a distance of 800 feet. A mat was woven of boards and slats, 517 feet long and 20 feet wide, and the bank protected to a 9-foot stage, and 290 feet additional bank protected to a 6-foot stage, no mat being built for that distance. The work was suspended on September 14, 1902 (stage, 3.8 at Keokuk), on account of

shoal water in the chute. The board mat consisted of 1-inch boards, 4 inches to 6 inches wide and 10 to 20 feet long, and followed the line of construction adopted on the Mississippi River below the Missouri. A liberal use of tenpenny nails was made in fastening the boards together, and the whole construction of the mat was so easy, the material so light and easily handled, the quantity of mat material so great per barge, that it offers in many respects marked points of superiority to a brush mat. This is especially true when the boards (culls) can be had cheaply from a neighboring mill, and especially when the high-water difficulty or impossibility arises of getting brush. The thickness of the mat is only about one-twelfth to one-sixteenth that of the brush mat, and the volume and weight of material to be handled is reduced in the same proportion. The lumber cost \$7.50 per 1,000 feet, and about 10,000 feet was used in the mat, which covered 10,340 square feet.

## BAR AT QUINCY.

No work was done on this bar (mile 521) during the year. Several surveys were made of the bar, showing that it has not been reduced in area in the last twelve months. During the progress of these surveys, except the last, unusual high water prevailed, the banks were under water, and conditions were unfavorable for good work.

## DREDGING QUINCY BAY.

No work was done in the bay during the past season except a rapid survey extending from the steamboat landing at Quincy to the head of the bay (miles 521 to 518). This survey occupied from August 23 to 26, 1902, but on account of the prevailing high water was considered inaccurate. Another survey of the bay was made in November, with better results.

I have been assisted in my work by Mr. John R. Carpenter, superintendent, and Mr. O. S. Willey, clerk, who have labored with zeal and efficiency.

Very respectfully, your obedient servant,

M. MEIGS, *U. S. Civil Engineer.*

Maj. C. McD. TOWNSEND,  
*Corps of Engineers.*

## REPORT OF MR. A. L. RICHARDS, ASSISTANT ENGINEER.

UNITED STATES ENGINEER OFFICE,  
*Rock Island, Ill., January 10, 1903.*

MAJOR: I have the honor to submit the following report of Mississippi River improvement work between Hannibal and mouth of Missouri River, the division in my local charge, for the calendar year ending December 31, 1902.

The improvement of this section of the river was carried on under project approved July 30, 1902, and the work was performed by hired labor and use of Government plant, the U. S. towboat *Vixen* being used for towing.

Owing to the heavy local rains and consequent high water during the season, the contractors were unable to furnish the quantity of material per day specified in their contracts, and thus the amount of work accomplished was considerably less than was contemplated.

Brush, delivered on United States barges, was purchased under emergency contracts, and was furnished by Anton Zehren, G. L. Nichols, and O. D. Sherry. The prices paid were 16½, 19, and 20 cents per cubic yard, delivered between Marion City (mile 531) and Hamburg (mile 593).

The rock was delivered on United States barges at the quarries at Hannibal. It was purchased under emergency contracts and was furnished by Hanes & Camery, George W. Camery, and M. E. Hueston. The price paid was 57 cents per cubic yard.

The working season opened July 14 and closed November 16, 1902. The towboat *Vixen* was laid up for the winter in the Des Moines Rapids Canal at Keokuk and the rest of the plant in the harbor at Portage Island.

Work was carried on at the following localities during the season: Vicinity of Mundys Landing, head of Island 451, foot of Hickory Chute, head of Hickory Chute, shore opposite Atlas Island, and above Hickory Chute.

*Vicinity of Mundys Landing (sheet 73, mile 558).*—The shore protection at Mundys Landing was repaired, three barges of rock being used.

*Island 451 (sheet 73, mile 558).*—The shore protection on head of this island, built in 1898, was raised from 10 feet above low water of 1864 to the top of the 14-foot bank.

# 1490 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

*Illinois shore opposite Atlas Island (sheet 73, mile 558).—*Closing Dam 10, between Illinois shore and Atlas Island, was built.

*Vicinity of Hickory Chute (sheet 74, mile 561).—*A series of three wing dams (17, 18, and 19) was built from the Missouri shore.

*Vicinity of North Fritz Island (sheet 74, mile 561).—*Wing Dam 16, built in 1897, was converted into a closing dam by being extended from its outer end to head of North Fritz Island. A shore protection was built on head of this island where the bank had been undergoing rapid erosion.

*Vicinity of South Fritz Island (sheet 74, mile 563).—*Closing Dam 14, built in 1896, between South Fritz Island and Illinois shore, was repaired where breaks had occurred.

*Head and foot of Hickory Chute, Missouri shore (sheet 74, miles 562 and 564).—*The shore protections, built in 1895, 1897, and 1898, were raised from 10 feet above low water of 1864 to top of 14-foot bank.

*In general.*—The water was at a comparatively high stage during the entire working season, and greatly interfered with the contractors in furnishing the material as required.

Mooring anchors, as described in Capt. Edw. Burr's annual report (see Report of Chief of Engineers, 1901, Pt. III, p. 2221), were used for holding barges in position. These anchors were given very severe tests, and in all cases proved to be the most economical and advantageous moorings that have been used in this division. They are light, easily put in and removed, and I heartily recommend their general use.

Further details as to the character and extent of the work done are shown in the appended tables.

## List of works constructed and repaired and of materials used during season of 1902 between Hannibal and mouth of Missouri River.

Designation.	Dimensions.		Material.	
	Length.	Height above low water, 1864.	Rock.	Brush.
Sheet 73 (mile 558):	<i>Feet.</i>	<i>Feet.</i>	<i>Cu. yds.</i>	<i>Cu. yds.</i>
Shore protection below Mundys Landing repaired .....	.....	12	288.9	.....
Shore protection on head of Island 461 raised .....	.....	10-14	377.4	.....
Closing Dam 10 .....	1,500	8	4,490.5	3,667.5
Sheet 74 (mile 561):				
Wing Dam 17 .....	1,500	5	3,715.8	5,008.7
Wing Dam 18 .....	1,100	5	1,818.4	1,920.2
Wing Dam 19 .....	350	5	387.5	967.1
Wing Dam 16 extended and converted into closing dam..	1,700	6	4,499.9	7,967.8
Shore protection, head of North Fritz Island .....	1,290	16	2,264.7	2,439.2
Sheet 74 (mile 562):				
Shore protection, head of Hickory Chute raised .....	.....	10-14	739.6	.....
Sheet 74 (mile 563):				
Closing Dam 14 repaired .....	.....	5	3,855.5	5,081.2
Sheet 74 (mile 564):				
Shore protection foot of Hickory Chute raised .....	.....	10-14	808	.....
.....	.....	.....	22,746.2	27,001.7

## Financial statement for work of constructing dams and shore protections between Hannibal and mouth of Missouri River, performed by hired labor during season of 1902.

Amount expended in field during calendar year 1902 .....	\$33,457.39
Add quota of general superintendence and office expenses .....	2,094.31
Add for use and deterioration of plant .....	5,597.28
Total .....	41,148.98
Material put in works:	
Rock .....	22,746.2
Brush .....	27,001.7
Total .....	49,747.9

Average cost per cubic yard:

On barges.....	\$0.360
For towing.....	.145
For putting in place.....	.165
For general superintending and office expenses.....	.042
For plant.....	.112
Total.....	.824

The total length of works constructed by day-labor work during the season of 1902 is as follows: Dams, 6,150 feet; shore protection, 1,290 feet.

During the season I was at all times ably assisted by Mr. E. F. McDonald, receiver of materials, whose work was very commendable.

Very respectfully, your obedient servant,

A. L. RICHARDS, *Assistant Engineer.*

Maj. C. McD. TOWNSEND,  
*Corps of Engineers.*

#### REPORT OF MR. C. W. DURHAM, ASSISTANT ENGINEER, ON PLANT.

UNITED STATES ENGINEER OFFICE,  
*Rock Island, Ill., January 5, 1903.*

MAJOR: I have the honor to present the following report on the floating stock or plant belonging to the improvement of the Mississippi River between the mouth of the Missouri River and St. Paul for the calendar year ending December 31, 1902:

In this report "good" is in fine condition, wanting slight repairs or none; "fair" requires extensive repairs or such as are advisable; "bad" should be condemned or rebuilt. Pieces condemned are omitted.

The plant in question is as follows: One large towboat (*Coal Bluff*), good; 2 medium-sized towboats (*Fury, Vixen*), good; 1 medium-sized towboat (*Alert*), fair; 2 small towboats (*Ruth, Mac*), good; 4 steam launches (*Emily, Elsie, Lucia, Florence*), good; 1 steam launch (*Louise*), fair; 2 steam launches (*Ada, Iris*), bad; 3 naphtha launches (*Myra, Dart, Edith*), bad; 2 dipper dredges (*Vulcan, Phoenix*), good; 2 suction dredges, good; 5 dump boats, fair; 1 dump boat, bad; 1 steam-drill boat, good; 1 steam-drill boat, fair; 1 steam-drill boat, bad; 1 double ponton, bad; 8 pontons, bad; 10 pontons, good; 1 pile driver, good; 1 pile driver, fair; 12 large quarter boats, good; 1 large quarter boat, bad; 5 small quarter boats, good; 1 small quarter boat, fair; 4 small quarter boats, bad; 2 large office boats, good; 1 large office boat, fair; 7 small office boats, good; 4 small office boats, fair; 3 small office boats, bad; 1 derrick boat, good; 1 store boat, good; 1 boathouse, bad; 3 building boats, good; 1 building boat, fair; 1 building boat, bad; 51 large barges, good; 16 large barges, fair; 1 large barge, bad; 1 small barge, good; 2 small barges, fair, and a large number of grasshoppers, loading boats, powder boats, and skiffs, mostly in good condition.

To the snag-boat service belong the side-wheel steamer *Colonel A. Mackenzie*, good, and the stern-wheel steamer *J. G. Parke*, bad.

The Des Moines Rapids Canal has a small plant, consisting of 1 steam launch (*Stella*), good; 1 dredge (*Ajax*), fair; 2 dump boats, fair; 2 small barges, fair; 1 small barge, good.

There has been expended on the plant belonging to general improvement, to December, 31, 1902, the sum of \$918,060.29, and its estimated value January 1, 1903, was \$130,980.14.

Very respectfully, your obedient servant,

C. W. DURHAM,  
*Assistant Engineer.*

Maj. C. McD. TOWNSEND,  
*Corps of Engineers.*

### A A 3.

#### OPERATING AND CARE OF DES MOINES RAPIDS CANAL AND DRY DOCK.

The Des Moines Rapids Canal was open to navigation during the fiscal year 235 days, during which time there passed through it 692

# 1492 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

steamboats and 212 barges, carrying 33,382 passengers, 14,170 tons of merchandise, and 23,921 bushels of grain. There also passed through the canal 18,940,636 feet B. M. of lumber, 2,850,000 feet of logs, 4,550,500 shingles, and 2,229,900 laths. This statement is about equal to that of 1902, the canal business of both years, especially in logs and lumber, being much smaller than usual on account of the prevailing high stages of water, which permitted most of the rafts and many boats to pass over the rapids outside of the canal.

The expenses of operating and care of the Des Moines Rapids Canal and Dry Dock have been, during the past year, \$40,623.37, the same being provided for under an indefinite appropriation made by act of July 5, 1884. Considerable repairs were made to the middle and lower locks, to the Sandusky sluice, and to the boom at the lower lock. Nominal repairs were made to the embankment and various buildings. Dredging was carried on from July 1 to October 8, 1902, and from April 22 to June 30, 1903, and amounted to 107,221 cubic yards, which makes the aggregate taken from the canal since June 30, 1878, 1,718,612 cubic yards.

The dry dock was in constant use. Dockage fees were collected to the amount of \$56.25.

Details of canal and dry-dock operations may be found in the report of United States Civil Engineer M. Meigs.

There are no outstanding liabilities.

## Money statement.

June 30, 1903, amount drawn from Treasury during fiscal year under indefinite appropriation.....	\$41,700.00
June 30, 1903, amount expended during fiscal year .....	40,623.37
July 1, 1903, balance on hand .....	1,076.63

## ABSTRACT OF APPROPRIATIONS AND ALLOTMENTS.

By act approved—		By act approved—	
April 30, 1878 .....	\$7,500.00	July 5, 1884, expended during fiscal year ending—	
June 18, 1878 (allotment) .....	32,500.00	June 30, 1890.....	\$43,995.80
March 3, 1879 .....	40,000.00	June 30, 1891.....	44,998.20
June 14, 1880.....	30,000.00	June 30, 1892.....	43,968.92
March 3, 1881, expended during fiscal year ending—		June 30, 1893.....	57,057.21
June 30, 1882.....	41,771.17	June 30, 1894.....	55,356.48
June 30, 1883.....	77,926.79	June 30, 1895.....	41,052.80
June 30, 1884.....	43,283.42	June 30, 1896.....	37,555.21
July 5, 1884, expended during fiscal year ending—		June 30, 1897.....	33,440.54
June 30, 1895.....	44,506.50	June 30, 1898.....	38,504.96
June 30, 1896.....	43,009.53	June 30, 1899.....	35,118.85
June 30, 1897.....	42,152.84	June 30, 1900.....	39,120.73
June 30, 1898.....	42,802.35	June 30, 1901.....	48,595.91
June 30, 1899.....	38,885.37	June 30, 1902.....	41,805.50
		June 30, 1903.....	40,623.37
		Total expended.	1,085,532.44
*	*	*	*



*Expenditures for operating and care of Des Moines Rapids Canal for fiscal year ending June 30, 1903.*

Month.	Office and administration.				Canal and locks.			
	Salaries.	Supplies.	Miscellaneous.	Total.	Labor.	Supplies.	Current repairs.	Total.
<b>1902.</b>								
July.....	\$375.00			\$375.00	\$1,595.00	\$61.84	\$76.55	\$1,733.39
August.....	375.00			375.00	1,630.43	192.60	90.08	1,913.11
September.....	375.00	\$20.58		395.58	1,443.33	31.95	94.22	1,569.50
October.....	375.00		\$16.83	391.83	1,699.89	80.38	130.97	1,911.24
November.....	375.00		7.75	382.75	1,485.00	189.20	102.42	1,776.62
December.....	650.00			650.00	1,300.04	163.35	1,844.34	3,297.73
<b>1903.</b>								
January.....	500.00			500.00	1,203.65	68.10	1,134.74	2,406.49
February.....	500.00	11.80	35.29	547.09	1,057.00	82.65	187.86	1,327.51
March.....	500.00	11.60	9.75	521.35	1,168.08	16.00	426.19	1,610.27
April.....	375.00		51.00	426.00	1,737.67	164.89	549.74	2,452.30
May.....	375.00	2.70	26.05	403.75	1,600.00	243.43	92.02	1,935.45
June.....	375.00		9.75	384.75	1,965.00	268.29	1,207.33	3,440.62
<b>Total.....</b>	<b>5,150.00</b>	<b>46.68</b>	<b>172.30</b>	<b>5,368.98</b>	<b>17,885.09</b>	<b>1,552.68</b>	<b>5,936.46</b>	<b>25,374.23</b>

Month.	Dredging canal.				Grand total.
	Labor.	Supplies.	Current repairs.	Total.	
1902.					
July .....	\$1,297.53	\$229.70	\$23.49	\$1,550.72	\$3,659.11
August .....	1,320.13	299.25	36.39	1,655.77	3,943.88
September .....	329.87	556.61	30.12	916.60	2,881.69
October .....	110.70	54.64	45.04	210.38	2,513.45
November .....			6.46	6.46	2,165.83
December .....	243.88		53.30	297.18	4,244.91
1903.					
January .....	231.98		294.82	526.80	3,433.29
February .....		292.70	97.08	389.78	2,264.38
March .....			111.12	111.12	2,242.74
April .....	579.85	313.12	330.25	1,223.22	4,101.52
May .....	1,327.16	726.50	100.99	2,154.65	4,509.73
June .....	337.37	427.50	32.61	837.48	4,662.36
Total .....	5,818.47	2,900.02	1,161.67	9,880.16	40,623.37

## COMMERCIAL STATISTICS.

*Traffic statement of the Des Moines Rapids Canal for the fiscal year ending June 30, 1903.*

Month.	Boats up.	Boats down.	Barges up and down.	Passengers.	Merchandise.	Grain.
<b>1902.</b>						
July.....	82	22	27	8,479	Tons. 2,658	Bushels. ....
August.....	57	36	19	10,741	2,674	596
September.....	69	75	42	5,547	1,514	500
October.....	53	57	25	2,064	1,495	2,000
November.....	30	39	46	98	594	800
<b>1903.</b>						
March.....	3	2				
April.....	19	7	8	833	657	940
May.....	64	11	21	1,293	2,603	4,835
June.....	55	11	24	4,277	1,975	14,250
<b>Total.....</b>	<b>432</b>	<b>260</b>	<b>212</b>	<b>33,332</b>	<b>14,170</b>	<b>23,921</b>

# 1494 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

*Traffic statement of the Des Moines Rapids Canal, for the fiscal year ending June 30, 1903—Continued.*

Month.	Lumber.	Logs.	Laths.	Shingles.	Lockage at one lock.
	<i>Feet.</i>	<i>Feet.</i>	<i>Number.</i>	<i>Number.</i>	
1902.					
July .....					112
August .....					93
September .....	11, 194, 500	2, 000, 000	1, 425, 000	1, 920, 000	235
October .....	6, 744, 000			2, 225, 000	129
November .....	1, 002, 136	850, 000	804, 900	405, 500	101
1903.					
March .....					9
April .....					40
May .....					75
June .....					88
Total .....	18, 940, 636	2, 850, 000	2, 229, 900	4, 550, 500	877

REPORT OF MR. M. MEIGS, UNITED STATES CIVIL ENGINEER.

UNITED STATES ENGINEER OFFICE,  
Keokuk, Iowa, July 1, 1903.

MAJOR: I have the honor to make the following report on "Operating and Care of the Des Moines Rapids Canal" during the fiscal year ending June 30, 1903:

The canal was closed for the winter on November 22, 1902, and opened as usual April 1, 1903, being open two hundred and thirty-five days and closed one hundred and thirty days. During the fiscal year the water averaged higher than usual. In July, 1902, a considerable flood occurred, reaching 15.5 feet above low water, and in August and October the stage was also above summer normal. The season of 1903 began with good water, culminating in a stage of 19.6 feet at the lower lock, the highest water, except in 1888, since 1851.

The prolonged high water that has prevailed during the fiscal year has, as a consequence, enabled many boats to pass over the rapids, and thus the traffic statement appears small by comparison with some years of low water.

## REPAIRING MIDDLE AND LOWER LOCKS.

Considerable repairs were made to the middle and lower locks. At the middle lock a small coffer dam, 5 feet high, was put in at the lower end in November, 1902, and the water pumped out of the lock chamber. A large amount of concrete patching was found to be necessary below the ordinary water line of summer navigation. The method employed was to cut out the rotten rock to a depth of from 2 to 12 inches; holes were then drilled in the face of the excavation with a small drill, and pieces of round scrap iron, old spikes, and the like were inserted in the holes and cemented in place to give a good bond between the patch and the old work. The breast wall at the upper end of the sluice was in especially ruinous condition, and was carefully repaired with 1-3-5 concrete, using Atlas Portland cement.

The lower parts of the middle lock sluice walls are in many places in very bad condition, owing to the decay of the stone, and will have to be repaired the coming winter. Repairs were found necessary at the middle lock to all of the 16 culvert gates and frames. The gates were taken to the machine shop and wearing strips,  $3\frac{1}{2}$  by  $\frac{1}{4}$  inch, were riveted on, making the gates as good as new. New frames were supplied to all the openings. The gates and frames were renewed eight years ago, so that we may expect that this work will not have to be repeated until 1911.

During the repairs to the lock chamber much inclement weather occurred, making the work slow and the drainage difficult. The concrete froze in places almost as soon as applied, but it seems to have set properly and makes a hard patch—better than the stone it replaced. There were found a good many cavities about the culvert gate frames where the water had bored through between the iron and the stone. All such openings were very carefully filled with good concrete.

## AT THE LOWER LOCK.

Extensive repairs were made to the breast wall of the sluice, which, like that at the middle lock, had become badly shattered by frost and water. The shattered stone was carefully removed and good 1-3-5 concrete used to replace it. All the

joints and seams were pointed up or grouted and the wall put in good condition. As at the middle lock, the decay of the stone in the sluice wall has left some large cavities, principally below the level of ordinary winter stages in the river, and these will have to be repaired during the coming year.

The ice houses at the middle and lower locks were repaired and put in good order, with new sills and sheathing inside where required. The wooden sills had rotted away and allowed the walls to spread, nearly wrecking the buildings.

#### REPAIRING SANDUSKY SLUICE.

Owing to the inconvenient shape of the slope wall on the canal side of the Sandusky sluice and the damage that had resulted to our dump boats in using it as a sluice for dredged material, two cement concrete piers were constructed, against which the dump boats could land in safety to their doors and sides. These piers were built 51 feet apart, and the masonry, about 8 feet square on top, rests partly on the slanting coping of the sluice walls and partly on the rock bottom of the canal. The piers are about 10 feet high and are thoroughly bolted to the sluice walls on which they rest and to the rock bottom with dowel bolts set in cement. A timber 12 by 12 inches, covered with iron, was doweled in to form the two corners of the piers where it was thought the greatest wear would come.

The concrete consists of Atlas cement in the proportion of 1-3-5. The total amount of material used was, cement, 172.3 cubic feet (140 sacks); sand, 516.9 cubic feet; broken stone, 861 cubic feet; total, 1,550 cubic feet. The measured solid contents of the piers is 849 cubic feet. The cost was as follows:

Cement, 35 barrels, at \$2.70.....	\$94.50
Hauling cement, lumber, etc.....	10.13
Labor on wall excavation and drainage .....	139.05
Superintendence and office .....	50.00
<b>Total .....</b>	<b>293.68</b>
<b>Cost per cubic yard.....</b>	<b>9.26</b>

This work was done by hand in very cold and bad weather, and does not show how cheaply concrete can be put in, but what it costs under bad conditions.

In addition to the work on the walls, a very considerable amount of work was done in wheeling out of the sluiceway an accumulation of stone deposited there from the dumps in the course of dredging. Wheelbarrows were used, and many cubic yards were moved out of the sluiceway and placed along the outside face of the canal embankment as a protection against the river.

#### CANAL EMBANKMENT.

During April a line of levels was run over the canal embankment to make a record and detect any subsidence since the last survey, eighteen years ago. Very little difference was noted, and the embankment appears to be in good condition. During the June high water of 1903, the embankment was carefully watched and patrolled by the dredge crew. One leak, about as large as a man's arm, occurred, but was stopped before any serious damage was done. The water above Keokuk was not extraordinarily high, though it got to 10.55 feet on the guard lock gauge, and put the canal out of commission by running the water over the top of the lower gates, so that the lock could not be operated. At the lower lock the water attained a stage of 19.60 feet,  $\frac{1}{2}$  foot lower than in 1888. This water overflowed the road in front of the canal office and all the grounds on the west of the sluice, but did not, as is usual, kill the grass. A cool spell after the water receded allowed the sod to dry out, and it seems little injured by a week's submergence.

The high water did little or no damage to the canal, but it was closed for through navigation from June 4 to June 7, inclusive.

#### DREDGING CANAL.

From July 1 to October 8, 1902, and from April 22 to June 30, 1903, dredge *Phoenix* and tender *Lucia* have worked, removing deposits from the canal, the greater part being sluiced out at the Sandusky sluice. That below the guard lock and that below the middle lock was towed out into the river above and below the canal.

There seems to be a tendency of the river to larger deposits, and the increased dredging of recent years only keeps the canal open without gaining on the deposits. At Lamallees Creek the canal was practically closed in April, 1903, by a heavy rain

# 1496 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

storm, in spite of the fact that it was twice thoroughly dredged last season. It is evident that the use of the dredge is becoming more and more an essential feature of the operating of the canal, and only an adequate plant will be able to keep up with the sedimentation constantly going on and increasing year by year.

## Statement of dredging.

Below lower lock .....	cubic yards..	701
Above lower lock .....	do.....	750
Below middle lock .....	do.....	1,711
Vicinity of Sandusky Creek .....	do.....	42,383
Vicinity of Ballingers Creek .....	do.....	32,144
Below guard lock .....	do.....	29,532
Total.....	do.....	107,221

## MACHINE SHOP AT LOWER LOCK.

During the winter months the shop was employed in repairs to the machinery of the steamboats *Vixen*, *Lucia*, and *Mackenzie*, dredge *Phoenix*, and launch *Edith*, as well as to the lock machinery. The engines of the *Vixen* were completely overhauled and altered so as to make them comparatively noiseless. New gears were made for the *Mackenzie's* capstans and the shafting repaired. A new tank was made for the lower lock, a new exhaust head for the guard-lock engine, and innumerable repairs were made to the plant in general. A new dipper of 2½ yards capacity was built for dredge *Vulcan*.

## OPERATING DRY DOCK.

The dry dock has been operated the whole year with a small force. Two of the packets used the dock for repairs, for which there were collected dockage fees of \$56.25. The light-house tender *Lily* also was docked for small repairs.

Two barges 100 by 20 feet (Nos. 206 and 207) were built. One pile driver (No. 104) was rebuilt with new hull and thoroughly repaired above deck. In addition, some repairs were made to 6 steamboats, 1 dredge, 1 drill boat, 2 quarter boats, 4 office boats, and 3 dump boats.

## BOOM BELOW LOWER LOCK.

This boom, about 800 feet, built in 1890, was docked, the decayed fence taken down and packed into the cavity in the body of the boom to displace the mud that gathers there and to increase its flotation. An entirely new fence was built, and all joints of the fence where two pieces of wood come together, as well as the tops of all posts, were painted with carbolineum to add to their durability.

## MISCELLANEOUS.

The canal office was thoroughly cleaned and calcimined, and the plastering repaired.

I have been ably assisted in the duties of this office by Mr. John R. Carpenter, superintendent, and Mr. O. S. Willey, clerk, who deserve commendation for efficient service.

Very respectfully, your obedient servant,

M. MEIGS,  
U. S. Civil Engineer.

Maj. JAS. L. LUSK,  
Corps of Engineers.

## A A 4.

## OPERATING AND CARE OF ILLINOIS AND MISSISSIPPI CANAL AROUND LOWER RAPIDS OF ROCK RIVER, AT MILAN, ILLINOIS.

During the past fiscal year the canal was in operation from July 1 to November 30, 1902, and from March 23 to June 30, 1903, a period of 252 days, during 18 of which (in May and June, 1903) the locks were flooded. There passed through it 753 boats and barges of an

aggregate tonnage of 32,790 tons, carrying 1,952 passengers and 1,333 tons of merchandise. The business of the year was larger than that of the previous year, and the reopening of the coal mines will add much to the traffic of the coming year.

Repairs to the canal and its appurtenances were nominal. The Moline Wagon Bridge over Rock River and the bridge over the canal at Milan were refloored, and the dams were reenforced on the upstream side with broken rock to prevent excessive leakage. Deposits of sediment, lodged below Lock No. 37 and above Lock No. 35, and a portion of the bar at the entrance to Blossomburg Landing, were removed by dredge. The dams in mouth of Rock River were raised and strengthened, and the lower one was lengthened 210 feet.

The expenses of the fiscal year ending June 30, 1903, were \$11,398.94, the same being provided for under act of July 5, 1884.

The canal was in local charge of Mr. J. C. McElherne, assistant engineer.

There are no outstanding liabilities.

#### *Money statement.*

June 30, 1903, amount drawn from Treasury during fiscal year under indefinite appropriation .....	\$11,400.00
June 30, 1903, amount expended during fiscal year .....	11,398.94
July 1, 1903, balance on hand.....	1.06

#### ABSTRACT OF ALLOTMENTS.

By act approved July 5, 1884, expended during fiscal year ending—

June 30, 1895.....	\$225.00	June 30, 1901.....	\$4,806.18
June 30, 1896.....	5,309.17	June 30, 1902.....	11,014.93
June 30, 1897.....	4,752.46	June 30, 1903.....	11,398.94
June 30, 1898.....	4,502.39		
June 30, 1899.....	3,304.92	Total .....	50,723.83
June 30, 1900.....	5,379.84		

*Summary of expenditures for operating and care of western section Illinois and Mississippi Canal for fiscal year ending June 30, 1903.*

Month.	Superintendence, office expenses, supplies, engineering, and contingencies.	Operating and care, locks and bridges.	Repairs.	Dredging.	Total.
<b>1902.</b>					
July .....		\$364.88			\$364.88
August .....	\$62.50	359.75	\$62.23	\$270.50	754.98
September.....	12.75	295.00	2,823.23	409.99	3,540.97
October .....	401.42	295.00	1,206.72		1,903.14
November.....	477.92	302.50	77.06		857.48
December .....	188.96	245.00	99.00		482.96
<b>1903.</b>					
January .....	275.00	245.75			520.75
February.....		245.00			245.00
March .....					
April .....	964.41	637.02			1,621.43
May .....	5.25	295.00	51.75	426.71	778.71
June.....	8.20	320.44			
Total .....	2,366.41	3,605.84	4,819.99	1,107.20	11,398.94

# 1498 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

## COMMERCIAL STATISTICS.

*Traffic statement of western section of Illinois and Mississippi Canal for the fiscal year ending June 30, 1903.*

Month.	Steamers.		Barge..		Number of pas- sengers.	Tons of freight.	Lockages at three locks.
	Number.	Tons.	Number.	Tons.			
1902.							
July .....	56	484	3	320	287	-----	125
August .....	56	1,140	41	3,404	210	85	132
September .....	64	1,135	20	2,560	209	70	183
October .....	38	619	14	1,737	97	81	143
November .....	47	619	38	3,352	76	50	143
1903.							
March .....	2	28	2	300	1	-----	6
April .....	68	1,677	22	2,560	286	183	161
May .....	120	2,659	35	6,243	388	302	263
June .....	109	1,467	18	2,486	448	412	155
Total .....	560	9,828	193	22,962	1,952	1,333	1,311

*Statement showing amounts dredged from canal and approaches.*

Location.	During year.	Total to date.
	<i>Cu. yds.</i>	<i>Cu. yds.</i>
Below Lock 37 .....	4,883	33,288
Above Lock 35 .....	325	2,138
Blossomburg Landing .....	5,000	5,000
Total .....	10,208	40,426

## A A 5.

### OPERATING AND CARE OF GALENA RIVER IMPROVEMENT, ILLINOIS.

During the past fiscal year the lock was open to navigation from July 1 to November 18, 1902, and from March 18 to June 30, 1903, a period of 235 days, during 73 of which the lock was flooded by high water. There passed through it 1,058 boats and barges, carrying 5,452 passengers and 616 tons of merchandise. The traffic was very small and about equal to that of the previous year. Small repairs were made to lock, dam, and grounds, and a small deposit of mud was removed from the upper entrance and chamber of lock.

A survey of the entire improvement was made in June, 1903, showing necessary dredging to the amount of 111,800 cubic yards to restore a 3-foot grade above the lock and 4 feet in Harris Slough.

The improvement was in local charge of Mr. J. C. McElherne, assistant engineer.

The expenses of the fiscal year ending June 30, 1903, were \$2,937.27, the same being provided for under act of July 5, 1884.

### *Money statement.*

June 30, 1903, amount drawn from Treasury during fiscal year under indefinite appropriation .....	\$4,000.00
June 30, 1903, amount expended during fiscal year .....	2,937.27
July 1, 1903, balance on hand .....	1,062.73

# APPENDIX A A—REPORT OF MAJOR LUSK.

1499

## ABSTRACT OF APPROPRIATIONS AND ALLOTMENTS.

By act approved—

September 19, 1890, purchase of improvement.....	\$100,000.00
July 5, 1884, expended during fiscal year ending—	
June 30, 1894 .....	635.68
June 30, 1895 .....	6,000.00
June 30, 1896 .....	3,400.00
June 30, 1897 .....	8,588.20
June 30, 1898 .....	5,890.05
June 30, 1899 .....	3,226.87
June 30, 1900 .....	8,750.94
June 30, 1901 .....	12,077.01
June 30, 1902 .....	9,166.68
June 30, 1903 .....	2,937.27
Total.....	160,672.70

*Summary of expenditures for operating and care of Galena River improvement for fiscal year ending June 30, 1903.*

Month.	Superintendence, office expenses, incidental repairs, and contingencies.	Operating.		Total.
		Labor.	Supplies.	
1902.				
July.....	\$177.89	\$160.00	\$27.25	\$365.14
August.....	422.50	160.00		582.50
September.....	96.99	160.00		256.99
October.....	4.99	166.00		170.99
November.....	4.99	160.00	82.22	197.21
December.....		120.00	8.03	128.03
1903.				
January.....		120.00	33.80	153.80
February.....		120.00		120.00
March.....				
April.....		304.00		304.00
May.....		164.00	34.61	198.61
June.....	100.00	360.00		460.00
Total.....	807.36	1,994.00	135.91	2,937.27

## COMMERCIAL STATISTICS.

*Traffic statement of the Galena River improvement for the fiscal year ending June 30, 1903.*

Month.	Boats up and down	Passengers.	Merchandise.	Lockages.
<b>1902.</b>				
July.....	114	628	<i>Tons.</i> 2	100
August.....	23	109	1	16
September.....	103	445	117	84
October.....	147	568	46	115
November.....	57	161	32	49
<b>1903.</b>				
March.....	11	35	7	
April.....	89	296	155	
May.....	246	1,183	206	87
June.....	267	2,027	50	62
Total.....	1,068	5,452	616	513

## A A 6.

## IMPROVEMENT OF HARBOR AT LA CROSSE, WISCONSIN.

In 1903 the levee was graded and the stone relaid over an area of 17,000 square feet.

*Money statement.*

July 1, 1902, balance unexpended.....	\$3, 178. 95
June 30, 1903, amount expended during fiscal year.....	1, 214. 60
July 1, 1903, balance unexpended.....	1, 964. 35

## ABSTRACT OF APPROPRIATIONS.

By act approved—

June 3, 1896 (allotment).....	\$5, 000
March 3, 1899.....	12, 000
Total.....	17, 000

## A A 7.

REPORT OF MAJ. C. McD. TOWNSEND, CORPS OF ENGINEERS, UPON EXAMINATION OF MISSISSIPPI RIVER AT THE FOOT OF DES MOINES RAPIDS, NEAR KEOKUK, IOWA, TO DETERMINE THE ADVISABILITY OF CONSTRUCTING A DAM AT THE FOOT OF SAID RAPIDS, AND UPON EXAMINATION OF THE LOCKS OF THE DES MOINES RAPIDS CANAL, TO DETERMINE THE NECESSITY AND COST OF ENLARGING THEM.

UNITED STATES ENGINEER OFFICE,  
*Rock Island, Ill., December 2, 1902.*

GENERAL: As instructed by your letter of June 20, 1902, I have the honor to present a report on the following paragraph of section 1 of the river and harbor act approved June 13, 1902, viz:

The Secretary of War shall cause an examination to be made of the Mississippi River at the foot of the Des Moines Rapids, near Keokuk, Iowa, to determine whether a dam constructed at the foot of said rapids would be a benefit or impediment to the navigation of said river. He shall also cause an examination to be made of the locks of the Des Moines Rapids Canal, to determine the necessity for and cost of enlarging such locks.

The Des Moines Rapids of the Mississippi River extend from Keokuk to Montrose, Iowa. The distance between the gauges at Montrose and the lower lock at Keokuk is 11.42 miles, and the fall at low water 22.6 feet, and at high water 15.6 feet. The greater part of this low water fall, 19.09 feet, is surmounted by a canal 7.6 miles long, with three locks 350 by 80 feet. The minimum depth in the canal is 5 feet and its width not less than 250 feet. The remainder of the rapids above the guard lock has been improved by cutting a channel 200 feet wide, with a depth of 5 feet at low water, through the obstructing chains of rock—an improvement similar to that carried out at the Rock Island Rapids.

The plans employed in the improvement of the Des Moines Rapids were unanimously recommended in 1867 by a Board of five engineers, of which Col. J. N. Macomb, Corps of Engineers, was presi-



dent. The advantages to commerce and navigation to be secured by the adoption of the plans decided upon were, as enumerated by the Board, the effectual removal of all the difficulties of navigating the rapids; the securing of 5-foot navigation in extreme low water (a depth sufficient to pass any boats that the bars in the river would permit to reach the canal); the shortest line from the head to the foot of the rapids; no interference with the free navigation of the river either at high or low stages, so that boats or rafts could always pass outside of the canal if they should so prefer; the water in the canal being slack, boats could ascend as quickly as they could descend, as the current would no longer be an obstacle; the canal could be run in all kinds of weather, by night as well as by day, perfectly safe at all times; the canal would afford a capacious, convenient, and safe harbor for boats and rafts during the winter, and also admirable sites for dry docks. Work on the canal was begun in October, 1867, but although the canal was opened in August, 1877, the rapids, improvement was not fully completed until late in 1893, the total cost being \$4,574,900.

**WOULD A DAM CONSTRUCTED AT THE FOOT OF THE DES MOINES RAPIDS BE A REVENUE OR AN IMPEDIMENT TO THE NAVIGATION OF THE MISSISSIPPI RIVER?**

The existing canal was especially intended for low-water navigation, and since it was opened the lowest stage at which a raft has been successfully run over the rapids was 2.8 feet above low water, as recorded on the Nashville gauge. The navigation over the rapids, as compared with that through the canal, shows for the twelve seasons, 1890 to 1901, inclusive, a passage of 713 rafts, representing an approximate tonnage of 4,278,000 tons, as against 765 rafts, with a tonnage of 4,590,000 tons, or more than 48 per cent of the logs and lumber passed over the rapids. It is noticed that during seven of the twelve years more rafts passed over the rapids than through the canal. The proportion of steamboats and barges running the rapids during the twelve years mentioned was much smaller, about 15 per cent, due in great part to the extra cost of special rapids pilotage, to the necessary risks, to the impracticability of running them at night, and to the difficulty of stemming the current and consequent slow progress in the case of heavily loaded boats and barges going upstream. It is manifest from the foregoing that with the existing canal and locks a continuous dam across the river at the foot of the rapids would be an impediment to the navigation of the Mississippi River compelling a large tonnage, which has heretofore used the open river to be locked through the canal, with the necessary delays resulting therefrom.

In view of the large commercial interests involved in the construction of such a dam, it is deemed proper to investigate the effect of abandoning the existing canal and substituting a dam at the foot of the rapids with a single lock. An able discussion of the subject will be found in the appended report of Mr. M. Meigs, United States civil engineer, who has been for many years in local charge of the operation of the Des Moines Rapids Canal. The time required for a boat without barges to pass down over the rapids from Montrose to Keokuk averages about 50 minutes; to go through the canal, 2½ hours; and were there a dam at foot of rapids, forming a pool above, with a single lock, the time would be about 1½ hours. A boat passing up by the

rapids requires about  $2\frac{1}{2}$  hours, by the canal  $2\frac{1}{2}$  hours, and would require by dam, single lock and pool, about  $1\frac{1}{2}$  hours. Rafts, which always go downstream, occupy in passing the rapids about 4 hours; in going through the canal, 24 to 48 hours; but by dam, single lock and pool, 14 to 24 hours only would be needed. In the latter case less time would be required with a larger lock than with one of the dimensions of those of the canal. Log rafts move more slowly through the locks than lumber rafts, as work can not be done at night on the loose logs, whereas lumber rafts can be kept in motion night and day.

Mr. Meigs has calculated, from the records kept at the canal and the Keokuk and Hamilton bridge, that, taking into consideration the entire traffic by both canal and rapids for the twelve years 1890 to 1901, inclusive, there would have been a saving in time, had there been a dam and pool with one lock, of about 12,000 hours in round numbers, or an average of 1,000 hours per year; that is, the delays in passing through the existing canal at low water, diminished by the gain in time in using the open river during high water, have exceeded the delays that would have occurred in passing through the open river and single lock by the amount mentioned. Estimating the average cost of running a boat at \$5 per hour, this is equivalent to a saving of \$5,000 per year, or \$60,000 in the twelve years under consideration—a saving of about six-tenths of a cent on each ton of freight that passed Keokuk.

A great part of the time now lost results from the necessity of breaking up rafts to pass them through the canal. As the rafting business on this river is declining, the prospective benefit would continue to decrease. In high-water years, when boats and rafts can pass freely over the rapids for protracted periods, the advantage is on the side of the canal and open river—as, for instance, in 1892 a comparison shows 1,121 hours in favor of present conditions as against the dam and single lock; in 1901, an ordinary year, there were 1,000 hours in favor of the dam and single lock. It appears, however, that while the proposed dam might in some years be an impediment, yet on the whole, taking into consideration a long term of years, the resultant is beneficial.

To operate and care for the Des Moines Rapids Canal, including repairs and the necessary dredging, costs about \$40,000 per year, while the cost of operating and care of the lock connected with the proposed dam would be about \$13,000; but the expense attendant upon the maintenance of a large dam exposed to damage from floods and ice gorges can not be estimated, and might be very large. A probable shoaling at the head of the rapids after a few years might also necessitate large periodical expenditures for dredging. At low water the risk of stoppage of navigation in the event of serious damage would be the same in the case of both dam and canal, but if such a contingency should occur at high or medium stages the present conditions would manifestly be far preferable.

While not called for by the resolution, it appears pertinent to the subject to invite the attention of Congress to the fact that a dam over 6,000 feet long that will form a pool on rapids having a fall of 22.6 feet and a lock with a lift of 22.6 feet at low water, whose gates must also be sufficiently high to surmount a rise of the river that at the head of the canal amounts to 12 feet, will be large and costly structures, and that such a dam will affect the interests of riparian owners for some distance above it.

## WHAT IS THE NECESSITY FOR ENLARGING THE LOCKS OF THE DES MOINES RAPIDS CANAL, AND WHAT WOULD BE THE COST OF SUCH ENLARGEMENT?

The available length of each lock is 291 feet, and width 78 feet, due allowance having been made for miter sills, batter of walls, etc., but boats 325 feet long have been locked through by maneuvering them in the lock and opening the gates one at a time. In the Report of the Chief of Engineers, United States Army, for 1900, pages 2683-2685, is given a table showing a list of all steamboats navigating the upper Mississippi River, with their dimensions. In this list only one boat, the *St. Paul*, has a greater length than 291 feet, its length over all being 302 feet. Little trouble is experienced in locking her through the canal, however, and so far as steamboats and barges are concerned the existing locks are large enough for any craft at present engaged in navigating the upper Mississippi or likely to do so in the near future. Two boats recently constructed at the Iowa Iron Works, Dubuque, Iowa, if fully completed would have been too large to enter the locks, and it was necessary to tow them through the canal in an unfinished condition and complete the work lower down the river; but these boats have been constructed for towing on the lower Mississippi—one as a car ferry and the other as a towboat for coal barges—and are not adapted to the navigation of the upper Mississippi.

The principal delays at the canal in past years have been to rafts which are broken up into sections and these sections locked through separately. The dimensions of the strings of log rafts as boomed together are such as to leave a very large space in the lock unutilized, and consequently more lockages are required, as shown in Plate V.<sup>a</sup> The strings of the Chippewa River rafts (Beef Slough), usually 6 in number, are 40 feet in width, and those from the St. Croix River (Stillwater), usually 4 in number, 60 feet, the latter being considerably better arranged for locking purposes. It will be seen from the drawing that a Beef Slough raft 600 feet by 240 feet requires 12 lockages, and a Stillwater raft of the same size 8 lockages. Log rafts can easily be put together in such a manner as to diminish the required number of lockages materially, but such a course has never been attempted. In the case of lumber rafts the space in the lock chamber is better utilized, as these rafts are built of small cribs, usually 32 by 16 feet, which can be so arranged as to waste little room. Lengthening the locks 300 feet would do away with one-half of the number of lockages, even if rafts were put together as at present. The lumber industry pertaining to the upper Mississippi River is now waning, however, and it is not probable that it will ever revive, as the timber adjacent to tributary streams has mostly been cut and marketed, and a great part of the sawmills on the river have been abandoned or transferred to remote pineries, whence shipment is made by rail or the lakes.

If in the future there should be a large increase in the commerce of the river, sufficient to justify an increase in the dimensions of the locks, it is probable that the navigation interests will demand greater facilities for overcoming the rapids than the present canal affords. The existing canal has a depth at low water of 5 feet, and conforms

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<sup>a</sup> Not printed.

to the existing project for the general improvement of the river. If the commerce increases so that locks 80 by 350 feet cause serious delays in the passage of boats, it will have attained such proportions as to justify a further development of the river, which will render necessary the reconstruction or abandonment of the entire canal.

Under any circumstances widening the locks would be inadmissible, as the expense and the interference with traffic while the work was going on would be very great. Lengthening the locks to 600 feet in the clear, as shown in the sketches, would cause no interference with navigation during construction, and would cost about as follows:

Guard lock.....	\$246, 369
Middle lock.....	325, 244
Lower lock.....	461, 832
Total.....	1, 033, 445

The estimates are given in detail in Mr. Meigs's report, as well as various items of information in regard to construction, arrangement of sluices, etc. His estimates are based on the use of the same kind of stone as is used in the locks as they now are. Concrete would probably be cheaper, but there would be a lack of uniformity in the appearance of the work.

In conclusion I have the honor to report that in my opinion, with the existing canal and locks, the construction of a dam across the Mississippi River at the foot of the Des Moines Rapids would be an impediment to the navigation of the river, but that a lock could be constructed in connection with the dam from which advantages could be derived that would compensate for the impediments created by the dam; that there also appears to be no necessity for the enlargement of the existing locks under present conditions of commerce, and, further, that the cost of an enlargement ample for any conceivable needs of navigation with the existing canal would be approximately \$1,000,000.

There accompany this report a map<sup>a</sup> of the Des Moines Rapids (Pl. I) showing the canal, the steamboat channel and the raft channel, with a profile of the steamboat channel, high and low water, slopes and elevations; also sketches<sup>a</sup> showing proposed enlargement of locks (Pls. II, III, and IV), a sketch<sup>a</sup> (Pl. V) showing size of lock as compared with size of the Stillwater and Beef Slough rafts, and a copy of a letter<sup>a</sup> from Mr. B. P. Taber, a prominent lumberman of Keokuk, Iowa, bearing on the subject.

Very respectfully, your obedient servant,

C. McD. TOWNSEND,  
*Major, Corps of Engineers.*

Brig. Gen. G. L. GILLESPIE,  
*Chief of Engineers, U. S. Army.*

(Through the Division Engineer.)

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<sup>a</sup> Not printed.

[First indorsement.]

OFFICE DIVISION ENGINEER,  
NORTHWEST DIVISION,  
*Chicago, Ill., December 9, 1902.*

Respectfully forwarded to the Chief of Engineers.

It appears that a dam at the foot of the rapids, if properly constructed with a lock, would not be an impediment to navigation, but would upon the whole be rather a benefit.

The law does not call for an opinion as to the advisability of building such a dam. It is understood that a private corporation contemplates building it for the purpose of developing water power. An abstract answer to the question of its effect upon navigation, omitting all questions of cost, therefore, seems to be proper.

There is no present or prospective necessity for enlarging the locks of the Des Moines Rapids Canal. That being so, the estimate of cost called for in the law might properly, perhaps, have been zero. The statement should be emphasized that the estimate of \$1,000,000 is for a remote and improbable contingency, and that there is nothing now in sight to justify the expenditure.

O. H. ERNST,  
*Lieut. Col., Corps of Engineers,  
Division Engineer, Northwest Division.*

[Second indorsement.]

OFFICE CHIEF OF ENGINEERS,  
U. S. ARMY,  
*December 18, 1902.*

Respectfully referred to the Board of Engineers for Rivers and Harbors constituted by Special Orders, No. 24, Headquarters Corps of Engineers, current series, for consideration and recommendation, as required by section 3 of the act of June 13, 1902.

By command of Brigadier-General Gillespie:

A. MACKENZIE,  
*Colonel, Corps of Engineers.*

[Third indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,  
*Washington, D. C., May 21, 1903.*

Respectfully returned to the Chief of Engineers, U. S. Army.

The Board of Engineers for Rivers and Harbors has given careful consideration to all data at hand bearing upon the proposition to construct a dam at the foot of the Des Moines Rapids, near Keokuk, Iowa. The effect of such a dam as a benefit or an impediment to navigation has been investigated, ~~as has~~ the necessity for enlargement of the locks of the existing Des Moines Rapids Canal.

Prior to 1877, at lower stages, a portage was necessary at this locality, where the Mississippi River falls 22.6 feet in a distance of 11.42 miles. In 1877 a lateral canal with 3 locks was opened to navigation, and the work, including channel excavation above the guard lock, was completed in 1893 at a cost of \$4,574,900. This canal has met the needs of navigation at low stages, while at high stages there has been open-

river navigation over the rapids. Each lock has a width of 78 feet, and an available length of 291 feet, and the draft provided for throughout the canal is 5 feet.

If, at the foot of the rapids, a dam were constructed of such height as to surmount the rapids with a single lift, there would be a gain of time for all navigation now passing through the canal and a loss of time for all navigation now using the open river for downstream passage. A careful analysis shows that, with a suitable lock, the gain on the whole would be greater than the loss. Such a dam would drown out the present canal, rendering it useless as an alternative route; if built with its crest about 30 feet above the plane of low water at Keokuk, it would raise low-water levels for distance of nearly 35 miles above, thereby effecting a certain improvement in existing conditions between the head of the present canal and Burlington, Iowa.

The annual cost of maintaining and operating a single lock may be estimated at \$13,000, as compared with a present annual expenditure of \$40,000 for maintenance and operation of the canal. On the other hand, there should be contemplated the necessity for more or less dredging at the head of the pool formed by any dam across the Mississippi River. The cost of maintenance of the dam would be indeterminate, though dependent upon the character of the structure. It would not be unreasonable to anticipate large expenditures for repairs at recurring periods. The damages due to backwater could easily be estimated and should be charged against the cost of the structure.

It is the opinion of the Board that a dam with lock might be constructed at the foot of the Des Moines Rapids which would be a benefit to navigation.

The statistics of commerce passing the Des Moines Rapids do not indicate a growth demanding an expensive increase of facilities. The cost of enlargement of the locks of the existing canal would, in the opinion of the Board, be out of proportion to resulting commercial benefits.

The Board is of the opinion that the interests of navigation at present require no improvements or alterations in the Des Moines Rapids Canal or its accessories; that the general character of the Mississippi River above and below the rapids limits to a very small sum, say, \$20,000 per annum, the measure of benefit that would result to commerce and to the Government from expenditures at the rapids, no matter how large, contributed no matter by whom.

It is well understood that the object sought to be gained in the construction of a dam is the development of from 50,000 to 60,000 horsepower by means of the fall produced at the dam. In this connection the Board recognizes the physical possibility of combining, in many instances, works for the development of power and for the improvement of navigation, with economical results. But no partnership of expense between these two interests is practicable in the case in question, for the reason that facilities for navigation have already been created.

The Government having already provided adequate facilities for navigation at this point, at an aggregate cost of \$1,574,900, should not be called upon for further expenditures, except for maintenance.

The Board was told by those apparently in a position to give reliable information that the interests behind the project for development of water power would be satisfied to build all necessary structures at

their own cost, on plans to be approved by the Secretary of War and Chief of Engineers, with the understanding that the Government should take over and maintain the lock and dam after construction.

It appears possible to construct the lock and dam as proposed, without interference with navigation. If so, the Board believes that the Government should not oppose the private enterprise, and should permit the construction and operation of the lock and dam, subject to such conditions as shall safeguard the interests of navigation.

Under the terms of the river and harbor act of June 13, 1902, authority for such construction may in ordinary cases be given by the Secretary of War. Application to the War Department in this case has not been made, apparently because the project was considered special, being made the subject of a separate item.

While recommending no opposition to such action by private parties as may be sanctioned by the proper authorities, the Board does not consider it advisable for the United States to undertake the proposed improvement.

For the Board.

CHAS. J. ALLEN,  
*Lieut. Col., Corps of Engineers,*  
*Senior Member of the Board.*

[Fourth indorsement.]

OFFICE CHIEF OF ENGINEERS,  
U. S. ARMY,  
*September 23, 1903.*

The views of the Board of Engineers for Rivers and Harbors, as expressed in the preceding indorsement, are concurred in.

G. L. GILLESPIE,  
*Brig. Gen., Chief of Engineers,*  
*U. S. Army.*

REPORT OF MR. M. MEIGS, U. S. CIVIL ENGINEER.

UNITED STATES ENGINEER OFFICE,  
*Keokuk, Iowa, September 22, 1902.*

SIR: I have to submit the following report on the paragraph of section 1 of the river and harbor act of June 13, 1902, reading as follows: "The Secretary of War shall cause an examination to be made of the Mississippi River at the foot of the Des Moines Rapids, near Keokuk, Iowa, to determine whether a dam constructed at the foot of said rapids would be a benefit or impediment to the navigation of said river. He shall also cause an examination to be made of the locks of the Des Moines Rapids Canal, to determine the necessity for and cost of enlarging such locks."

This paragraph naturally divides itself into two parts—first, the benefit or impediment a dam would be to navigation, and, second, the necessity for and cost of enlarging the locks of the present canal; and I shall deal with them separately.

(1) THE BENEFIT OR IMPEDIMENT A DAM WOULD BE TO THE NAVIGATION OF THE RIVER.

The rapids of the Mississippi River above the mouth of the Des Moines River extend from Keokuk to Montrose, Iowa, a distance of about 11 miles, measured along the right bank of the river. The low-water slope amounts to 22.6 feet and the high-water slope to 15.6 feet. The difference is caused by the filling up of the angle in the slope at the foot of the rapids, which takes place in all similar situations, the river tending at high water to even up the irregularities of slope and bottom and make slopes of less abruptness and easier curves from one slope to another. This is a common observation and obtains on all streams in a greater or less degree,

according to the form of the bed. The prevailing characteristic of the rapids under discussion is extreme flatness of bed. The Mississippi River here flows between limestone bluffs, about three-fourths mile apart, in a gorge with practically no bottom land at the foot of the bluffs on either side. The bed of the stream consists of nearly horizontal limestone ledges worn into holes here and there, but so nearly horizontal between banks of the river and so nearly following the slope of the river that while at low water no ledges are exposed it would be possible for a man to wade across the river without the water going above his knees were he able to follow the line of least depth.

This flatness is in marked contrast to the chains and pools of the Rock Island Rapids, where the strata are tilted and form pools and chains. The difference in the character of the rapids at these two places is indicated by the methods adopted by the Government for their improvement. At the Des Moines Rapids to have improved the bed of the river by excavation would have required a cut 11 miles long, practically continuous, in which nearly all the flow of the stream would be contracted. This submarine excavation would have been enormously expensive, and would have formed a shallow sluice with a swift current and all the dangers incident to navigating boats in such narrow and shallow channels bordered by rocks. At Rock Island Rapids, on the contrary, it was only necessary to unite the pools, which like a string of lakes formed the natural channel, to make good navigation. There the descent from one pool to another is marked by a swift current, but in short stretches easily surmounted, and the enlargement of the artificial cuts between pools and the equalizing of the slopes at some points where the current gave trouble have been followed by the best results.

A lateral canal, therefore, was the logical improvement for the Des Moines Rapids and an improvement of the bed of the stream best suited to the conditions at the Rock Island Rapids. Now that the canal is built and has been in use for twenty-five years it is possible to study, statistically, the value of the river for navigation outside of the canal when the stage of water is such as to make that possible. The canal was built for low-water navigation, the swifter navigation of the rapids themselves being available when the stage permits. There are two channels on the rapids. One is called the "raft channel," and can be navigated by all boats at moderate stages; the other is known as the "steamboat channel," is considerably deeper, and was navigated before the construction of the canal whenever the water got so low that the eddies, swirls, and breaks on each side gave the pilot the marks required to keep the boat accurately in the channel. There was a race of skilled pilots in the early days who took boats through these channels. They acquired great skill and could very accurately gauge the depth at which a boat could go over the rapids. The steamboat channel is extremely narrow, so much so that a large side-wheel boat in places would walk her wheels on the rocks on both sides of the channel while the hull floated in the middle. It is to be understood, however, that no boat nowadays would accept the risks of sinking and damage by crossing the rapids at low water, except in case of a great emergency, when the canal was closed and the gain proportional to the risk.

From Mr. Charles Farris, of Montrose, at present (with one exception) the only available and active rapids pilot, I have obtained a schedule of depths and stages which the rapids pilots made use of to determine the allowable draft of boats they were to take over.

The stage was determined by the mark established on a large boulder, called Mechanics Rock, near the Iowa shore, about 2 miles below Montrose, during the then unprecedented low water of 1864. The low water of 1864 was also indicated as the zero of the gauge kept at Montrose by the resident pilots, and the "board," as it was called, was marked in feet and inches above this 1864 low-water datum. The low-water elevation at Mechanics Rock is 32½ inches below the top of the rock.

It was customary to use the raft channel entirely up to the time the top of Mechanics Rock emerged, or 32½ inches above low water, as even at a considerably greater stage the high rocks on each side of the steamboat channel, the difficulty of keeping a large boat in it, and the obscurity of the marks by which the pilots ran, made this channel practically unnavigable.

Owing to the fact that a channel, like a chain, is only as good as its weakest link, an empirical formula was evolved by long experience in taking boats over, which enabled the pilots to determine just what draft was possible in order to get safely over the shallow place. I have embodied this set of rules in the following table. It will be noticed, perhaps, that these figures do not in all places appear consistent, but they are explained by the fact that the lower the water gets in the steamboat channel the better the sides of the channel are marked and the closer and safer the pilots can manage their boats.



Table showing corrections used by rapids pilots to determine the allowable draft and depth of channel across the Des Moines Rapids, the stage of water being above low water of 1864 at Mechanics Rock.

Raft channel.		Steamboat channel.	
Stage, Montrose.	Available depth.	Stage, Montrose.	Available depth.
7 feet, subtract $8\frac{1}{4}$ inches = 6 feet $3\frac{1}{4}$ inches.		7 feet. Never used.	
6 feet, subtract 7 inches = 5 feet 5 inches.		6 feet. Never used.	
5 feet, subtract 7 inches = 4 feet 5 inches.		5 feet, add 0	= 5 feet 0 inch.
4 feet, subtract 7 inches = 3 feet 5 inches.		4 feet, add 10 inches	= 4 feet 10 inches.
3 feet, subtract 5 inches = 2 feet 7 inches.		2 feet $8\frac{1}{4}$ inches, add 10 inches	= 3 feet $6\frac{1}{4}$ inches. <sup>a</sup>
2 feet, subtract 4 inches = 1 foot 8 inches.		2 feet, add 16 inches	= 3 feet 4 inches.
1 foot, subtract 3 inches = 0 foot 9 inches.		1 foot, add 18 inches	= 2 feet 6 inches.
		0 foot, add 18 inches	= 1 foot 6 inches.

<sup>a</sup> Top of Mechanics Rock shows.

The above figures for stage should have about 0.4 foot added to make them agree with the gauge on the inside of the river pier of the guard lock, which is affected by piers and obstructions above it, adding about 5 inches to the readings at low-water stages. The zero of the gauge is at the correct elevation, but the changes in the surroundings have made the correction necessary. For correct stage to apply to the rapids on the guard lock gauges, subtract 0.4 foot.

The canal is 7.6 miles long and has three locks, with a total low-water lift of about 20 feet. The time required for a large boat without tow to pass through the canal is  $1\frac{1}{2}$  to 2 hours in either direction. Upstream over the rapids the time is little less, even at high water, owing to the heavy current. Downstream, outside, the boats go the length of the canal in 30 to 40 minutes, depending on the stage and the boat.

Rafts going through the canal require time according to size and activity of crew, weather conditions, and whether of logs or lumber. A log raft of normal size and under good conditions requires 40 to 50 hours until ready to pull out of the lower lock. Log rafts can not be taken through in the night, as the men can not work in the loose logs. A lumber raft can go through, day or night, and a raft of, say, 2,000,000 feet B. M. will require but 24 to 36 hours to make the passage from entrance to exit from the bay below lower lock.

I have calculated from the records kept at the canal and those kept on the Keokuk and Hamilton bridge just below the canal the actual time consumed in the passage between Montrose and Keokuk of every boat, raft, and barge that has made the trip, up or down, from January 1, 1890, to January 1, 1902—12 years. In addition, I have estimated the time that would have been made by these boats, rafts, and barges had there been a dam and pool, with one lock of 350 feet by 80 feet, the size of the present locks, and a single lift from the river to the pool equal to the extreme difference of level between Montrose and Keokuk at low water.

	Hours.
Total hours actually consumed under the present conditions, part canal and part free navigation outside the canal.....	57,833
Total hours under assumed conditions of dam, with pool and one lock.....	46,086

Difference in favor of dam and single lock ..... 11,747

About 20 per cent in favor of the dam and single lock.

Were such a great work as a single dam and lock ever undertaken for surmounting the Des Moines Rapids, it is probable that the lock would be designed not less than 600 feet long. With such a lock the figures above would have to be considerably modified, and would show a greater gain than the 20 per cent I have estimated.

I have conversed with many steamboat and raft pilots on this subject, and the consensus of opinion seems to be that the dam and single lift would be much better for steamboats than the long and shallow canal, with its tedious navigation and three locks to enter, at each one of which the risks of damage by careless handling or a sudden gust of wind throwing the boat against the lock wall must of necessity be incurred.

I think, were it built, there would be no question but that steamboatmen would be very loath to go back to the present system.

At present there is the advantage that should the canal be closed by an accident to the gates, or even one lock, or a sudden rush of water from one of the creeks entering the canal, filling the bed of the canal with a local and temporary impediment, the

free navigation of the river outside would still exist. These cases have both occurred in the twenty years of my connection with the canal. In the first case the delay to navigation was one week, while new gates were being built, the river being too low for navigation; the second case occurred when the water was high enough to navigate the rapids, and little or no delay occurred. The shoal was removed from the canal in twenty-four hours.

At low water the risk of actual stoppage of navigation would be the same in the case of dam or canal, should either become inoperative from any cause, say an earthquake, a possibility not so remote as might be supposed, for one actually occurred here in 1887 sufficient to rattle pictures on the walls and swing doors and shutters to and fro and cause us to carefully inspect the locks for damage.

The maintenance and operating of the present canal costs about \$40,000 per annum. With a dam and single lock, which of course would be operated by water power, the expense of operating the single lock would be about \$13,000.

Extraordinary repairs to such a great engineering structure as a dam across the Mississippi can hardly be foreseen or estimated. Such a dam, if constructed by the Government as a fixed masonry dam, would afford an enormous water power, estimated at a minimum of 60,000 horsepower. This power, if sold, would become a source of revenue ample to pay the cost of operating the lock, and would probably leave a large surplus.

There is still the question of sedimentation gradually filling up the pool and reducing it to the condition of any other reach of the river with little slope and sluggish current. This sedimentation would naturally begin at the upper end about Montrose, and have to be taken care of by dredging, or concentration of the channel by wing dams.

On the upper river there are long stretches, such as the one above the Wisconsin River, where the sand from the Wisconsin has formed a natural dam; also Lake Pepin, where the Chippewa enters and gorges the river bed with sand, damming back the flow of the river into the pool called Lake Pepin.

These two reaches seem, in the twenty-five years of close observation of the river since its improvement began, to have changed but little. They maintain their depth, and it is probable that in the pool above the dam at Keokuk, if built, the sedimentation would not interfere with navigation for many years, excepting perhaps in a short stretch—say a mile—about Montrose.

From all the above considerations I am led to think that a dam and single lock would not be a detriment to navigation, but an improvement on the present system. I believe, were the problem to come up at the present time as an entirely new proposition, that the great water power created, the actual advantage to navigation in point of time, and the reduced cost of operation, would determine the choice of the method of improvement in favor of some form of dam and pool as against a canal and three locks.

In this answer to the question propounded by Congress no reference is made to cost, nor is the proposition considered by me as anything but an abstract one without reference to advisability or necessity.

## (2) THE NECESSITY FOR AND COST OF ENLARGING THE PRESENT LOCKS OF THE DES MOINES RAPIDS CANAL.

The present commerce of the Mississippi River between St. Paul and St. Louis is carried on in boats small enough to easily pass through the present locks, 350 feet by 80 feet. The actual available length of the locks when allowance is made for the miter sills and the thickness and curved path of the point of the gate in opening and closing is 291 feet. By holding a boat in the center of the lock and maneuvering the stern so as to open one gate at a time, boats 325 feet long have frequently passed through. The locks are large enough for any boat plying the Upper Mississippi, or likely to do so.

The great delay at the canal is to rafts. Owing to the unfortunate dimensions of the slips in which the log rafts are built up and put together, namely, 40 feet wide on the Upper Mississippi and 60 feet wide at Stillwater, a very large space in the lock is left unutilized (Plate V). With a Mississippi raft this space is about 40 feet, or one-half the available room in width. The "strings of logs," as they are called, are not accurately 40 feet wide. They are 40 feet large, and when two strings have been forced into the lock the slight batter of the walls of the lock (1 inch in 4 feet) caused them to wedge so that they could not be pulled out. Much better results, of course, are attained with the Stillwater rafts of 60-foot strings, but these still sacrifice one-third of the available room.

To accommodate the raft business the locks might be lengthened. This could be done, I think, without interfering with traffic by putting in the foundations of the

lock extension in the winter and continuing to build during the following summer season. To attempt to widen the locks would involve expenses and delay to navigation too great to contemplate. In fact, for rafts and for all but one or two boats that have appeared in the twenty-five years the canal has been in use a narrower lock would have answered.

On an available width of 78 feet and a draft of 5 feet the present locks will accommodate a barge, allowing 15 per cent for model, with a displacement of 3,000 tons.

To enlarge the locks by lengthening would be vastly easier than to do so by widening. It would be best for rafts and for most large tows, and, as before stated, could be executed with the least delay to navigation.

If navigation again becomes heavy on the Upper Mississippi it is certain that the tendency will be, as it has been on all other waterways, to cheapen cost of transportation by increasing the size of boats and tows. This has been the history of the Great Lakes, the ocean, and on the Ohio. On the ocean and lakes there are physical objections to boats with shallow hulls, and there the tendency is constantly to deeper draft as well as greater length. There is no reason, however, why on placid waters like the Mississippi and Ohio the increase of capacity may not be borne by increasing width and length and retaining a maximum draft of, say, 5 feet.

The man that designs boats for such future trade will adapt his models to the present locks, which seem wide enough, or, using a common proportion between width and length, they would accommodate a barge of 78 feet beam and (if the locks were long enough) 468 feet long. Having a draft of 5 feet, this barge would displace 4,700 tons. It is by such barges as this, and towboats in proportion, that the commerce of the future must be carried on to be successful. Three or four such barges will make a tow that will be an economical one to handle.

A raft of 3,000,000 feet B. M. of lumber weighs about 6,200 tons, and is handled with one of the modern raft boats of 300 or 400 horsepower. The number of boats formerly in this industry shows how profitable it must have been. At present this business of towing rafts is on the decline, and, so far as present navigation and that of the future is concerned, the rafting business may almost be left out of consideration as a thing of the past. Should it be revived, it would be better to lengthen than to widen the locks.

In conclusion, I can find but three boats between Pittsburg and St. Paul too large to pass the Keokuk locks. No boat adapted to present navigation on the Upper Mississippi finds the locks too small. In my opinion they are at present quite adequate to the navigation. Were the business of towing freight on large barges, or were the lumber and log industry to revive, there is no doubt but that it would be advantageous to lengthen all these locks to 600 feet in the clear, which is the length of a log raft.

Two methods are possible in enlarging the locks: First, to build an entirely new lock, as they did at the Soo. There is room enough at each lock to build a new lock alongside of the present one without disturbing the present lock or interfering with traffic. Second, to lengthen the locks downstream, putting in the foundations in the winter and getting the walls high enough to be above water when navigation opens in the spring. Were the locks to be widened the time would be too short during the winter and navigation would be cut off until the new walls were finished. In view of the fact that it seems unnecessary to go to this great expense to accommodate one or two boats that possibly would desire to pass the canal at long intervals, no estimate is made for widening.

To lengthen the three locks to 600 feet in the clear, I submit diagrams and estimates. I have put the masonry at \$25 per cubic yard. This includes all costs of foundation, bailing and draining, cofferdams, etc.

The cofferdam at the lower lock will be expensive, but at the other locks only nominal. Most of the rock excavation could be done by drill boat and dredge in advance of putting in the cofferdams.

One thing will increase the expense, and for that reason I have estimated large contingencies—that is, that the foundation and walls up to about 7 feet high will have to be done during the winter in order to preserve navigation. I feel confident that it can be done, but it makes doubtful the amount of work a man can do in one day, and the obstacles to be overcome.

I submit sketches<sup>a</sup> (Plates II, III, IV) of the proposed lengthening of the locks to 600 feet in the clear. At the guard lock I propose to let the sluice discharge into the lock chamber. It certainly will be better for boats than it is now when the cross current from the sluices catches them just as they enter the lock. I can see no objection to it, and it will save the erection of a new sluiceway at a very considerable expense.

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<sup>a</sup> Not printed.

## 1512 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

I do not propose to provide any more filling capacity for the double lock than is now available. The extension will be usually out of use, and will serve only as an entrance way to the present lock. The emptying culverts might be made larger than the present ones, however, so as to save time. As it is new work, it would be as easy to make them larger as of the present size.

At the middle lock no problem presents itself. As the lock grounds are ample in size, I have provided for only one wall of the sluice extension. It will leave a bay where a barge or boat can be safely tied up.

At the lower lock the new arrangement of the lock will in some ways be an improvement on present conditions. The straight wall and its continuation by the boom will be a better approach than we have now. The bay between the lock extension and the shore will afford a safe harbor for the numerous naphtha launches, steamboats, etc., that now tie up below the bridge.

The present rafting ground between the bridge and the lock will, however, be destroyed, as it will be too short for an ordinary raft. There will have to be made provision below the landing by driving piles or erecting cribs, so that the strings of logs, etc., as they come into the lock can be dropped down there and assembled into a raft.

I have assumed the extension of the locks to be made of the same stone as the present work. If built of concrete it might be cheaper, but would not be uniform in appearance with the existing masonry. I have supposed the filling would be mostly sand dredged and then put in place by a centrifugal pump. I believe my figures to be substantially correct and sufficient. A detailed study of the work would, no doubt, enable one to make some economies.

*Estimated cost of extending the three locks of the Des Moines Rapids Canal to 600 feet in the clear.*

## Guard lock:

Rock excavation, 3,333 yards, at \$3.....	\$10,000	
Earth filling, 45,707 yards, at 40 cents.....	18,283	
Masonry, 6,001 yards, at \$25 .....	152,025	
Lock gates .....	10,000	
Culvert pipes and machinery.....	15,000	
Contingencies .....	41,061	
		<hr/> \$246,369

## Middle lock:

Rock excavation, 3,333 yards, at \$3.....	10,000	
Earth filling, 36,281 yards, at 40 cents .....	14,512	
Masonry, 8,861 yards, at \$25 .....	221,525	
Lock gates .....	10,000	
Culvert pipes and machinery.....	15,000	
Contingencies .....	54,207	
		<hr/> 325,244

## Lower lock:

Rock excavation, 5,100 yards, at \$3.....	15,300	
Earth filling, 27,650 yards, at 40 cents .....	11,060	
Masonry, 14,240 yards, at \$25 .....	333,500	
Lock gates .....	10,000	
Culvert pipes and machinery.....	15,000	
Contingencies .....	76,972	
		<hr/> 461,832

Grand total ..... 1,033,445

Very respectfully,

M. MEIGS, *U. S. Civil Engineer.*

Maj. C. McD. TOWNSEND,  
*Corps of Engineers.*

## A A 7.

ESTABLISHMENT OF HARBOR LINES ALONG THE MISSISSIPPI RIVER  
AT ST. PAUL, MINNESOTA.

CITY OF ST. PAUL, EXECUTIVE DEPARTMENT,

*St. Paul, August 12, 1901.*

DEAR SIR: I have the honor to call your attention to the accompanying resolution<sup>a</sup> adopted by the common council of this city directing that the city of St. Paul, through its proper representatives, call upon the United States Government to establish a fixed harbor line, beginning at the Chicago, St. Paul, Minneapolis and Omaha bridge, crossing the Mississippi River, thence running in an easterly direction along the south bank of the river to the city limits, which resolution was approved by me, as mayor, August 8 instant, and to request on behalf of this city that the action therein suggested be taken at as early a time as may suggest itself to you or to such other official of the Department as you may refer the subject to.

Very respectfully, yours,

ROBERT A. SMITH, *Mayor.*

Hon. ELIHU ROOT,

*U. S. Secretary of War, Washington, D. C.*

[Second indorsement.]

OFFICE CHIEF OF ENGINEERS,

U. S. ARMY.

*August 26, 1901.*

Respectfully referred to Maj. C. McD. Townsend, Corps of Engineers, for report.

To be returned.

By command of Brig. Gen. Gillespie:

A. MACKENZIE,

*Colonel, Corps of Engineers.*

[Third indorsement.]

U. S. ENGINEER OFFICE,

*Rock Island, Ill., April 21, 1902.*

Respectfully returned to the Chief of Engineers, U. S. Army, attention being invited to my report of this date and accompanying tracing<sup>a</sup> transmitted herewith.

C. McD. TOWNSEND,

*Major, Corps of Engineers.*

[Eighth indorsement.]

OFFICE CHIEF OF ENGINEERS,

U. S. ARMY,

*August 18, 1902.*

Respectfully returned to the Secretary of War.

The authorities of the city of St. Paul, Minn., request the establishment of harbor lines along the Mississippi River at that place.

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<sup>a</sup> Not printed.

1514 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

In the consideration of this proposition a special survey of the locality has been made and a public hearing for all interested parties has been held.

Inviting attention to the accompanying report of April 21, 1902, by the local engineer officer, I recommend that the lines selected by him be approved and that the Secretary place his approval upon the tracing<sup>a</sup> and detailed description of the lines (herewith), both of which have been prepared for his signature.

A. MACKENZIE,  
*Acting Chief of Engineers.*

[Ninth indorsement.]

WAR DEPARTMENT,  
*August 20, 1902.*

Approved as recommended by the Acting Chief of Engineers.

WM. CARY SANGER,  
*Acting Secretary of War.*

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REPORT OF MAJ. C. M'D. TOWNSEND, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,  
UPPER MISSISSIPPI RIVER IMPROVEMENT,  
*Rock Island, Ill., April 21, 1902.*

GENERAL: As directed by second indorsement dated August 26, 1901, on letter addressed to the Hon. Secretary of War by Hon. Robt. A. Smith, mayor of St. Paul, Minn., dated August 12, 1901, requesting the establishment of fixed harbor lines at St. Paul, I have the honor to present the following report:

With Mr. Smith's letter is a copy of a joint resolution adopted by the common council of the city of St. Paul and approved by the mayor August 8, 1901, as follows:

*Resolved*, That whereas a number of improvements are being carried on and are contemplated along the levee on the south side of the Mississippi River; and

Whereas the river is continually being encroached upon: therefore,

*Be it resolved*, That the city of St. Paul, through its proper representatives, call upon the United States Government to establish a fixed harbor line, beginning at the Chicago, St. Paul, Minneapolis and Omaha bridge crossing the Mississippi River, thence running in an easterly direction along the south bank of the river to the city limits.

Adopted by the assembly July 18, 1901.

Adopted by the board of aldermen August 6, 1901.

Approved August 8, 1901.

This matter having been referred to me, I stated in my letter of September 18, 1901, that—

This resolution asks only for harbor lines on the south bank, and was passed under the impression, as I am now informed, that harbor lines had already been established on the northerly or left bank, which is not the case. No harbor lines have been established at St. Paul except for a space of about 4,200 feet on the north side, extending down river from the Chicago and Great Western Railway bridge, which line was approved by the Secretary of War May 27, 1901.

In my opinion, if the subject is taken up at all, harbor lines should be established on both sides of the river, taking into consideration river improvements built and projected and the width of waterway needed for navigation interests. The city has about 11 miles of river frontage, and considerable survey and office work is needed

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<sup>a</sup> Not printed.

for a proper consideration of the subject. I find on investigation that we have no good map of a great part of the river in question subsequent to that made in 1882. Many changes have occurred since that time, and a new survey will be necessary to fit existing conditions.

I would therefore respectfully recommend a survey of the river in this locality, with a view not only to establishing harbor lines, but also to preparing projects for improvement work in the vicinity. I propose to make the survey this fall and to allot from available funds pertaining to appropriations for improving Mississippi River from Ohio River to St. Paul the sum of \$500 for the purpose, for which allotment authority is hereby requested. If such survey is made at once, a report and map can be submitted sometime during the coming winter.

My recommendation having been approved by you September 23, 1901, a survey of the river and adjoining shores, including the entire river frontage of St. Paul, was made in November and December, 1901, from which maps in detail were plotted; these maps, made to a scale of 1 inch to 100 feet, consist of five sheets and cover about 5½ miles of river, or 11 miles of frontage.

The city of St. Paul claims ownership to about 3½ miles of river front on the southerly bank and about 2 miles along the northerly bank. The upper and lower steamboat landings, above the Wabasha Street Bridge and below the Robert Street Bridge, respectively, occupy a small part of the city frontage of the northerly bank. The railroads own about 3½ miles of river front, about equally divided between the northerly and southerly shores. The remainder, about 2 miles, is private property, most of which lies along the left bank below Dam 18 and is of small value at present. Harriet Island is owned by the city of St. Paul. On this island the city has established the St. Paul Free Public Baths, under the commissioner of health. Raspberry Island and a small island just below, sometimes called McBoal Island, known also as Government lot 10, section 5, are owned by private parties.

Notice of a public hearing to be held at 2 p. m. April 10, 1902, at the United States Engineer Office, Army building, St. Paul, Minn., was published in the Pioneer Press, the Dispatch, and the Globe, all at St. Paul. Written notices were sent to the mayor of the city, the presidents of assembly, board of aldermen, board of public works, the city clerk, the city engineer, and the commissioner of health; to the secretaries of the chamber of commerce and the Commercial Club; to all property holders along the river front whose names could be ascertained, and to all local navigators. These notices invited interested parties to inspect the maps showing the proposed harbor lines which were on exhibition from April 1 to April 10, and also to be present at the meeting.

The meeting was attended by representatives from the city, from the chamber of commerce, the Commercial Club, and the railroads; some fifteen or twenty private property owners and steamboat men were present. Discussion was invited and was freely indulged in. The proposed harbor lines met the approval of the representatives from the city, the commercial bodies, and the railroads. Private parties took exception at only two points. The owner of block H, at the south end of the Wabasha Street Bridge, wanted the harbor line to coincide with the north line of block H, all of which block when platted was in the river bed. A representative of one of three owners of Government lot 10, section 5, desired that a harbor line be established around this lot 10 and that the harbor line along the southerly shore opposite this island be placed farther back.

Lot 10 was formerly a small island. The island disappeared, and in 1884 a survey made at a stage of 2.5 feet above low water shows a sand bar about 100 feet wide and 500 feet long, entirely clear of trees and brush. In 1885 an L dam was built at the location of lot 10, since which time the bar has been built up by the deposits from the river until it is at present about 150 feet wide and 900 feet long, of a height from 3 to 8 feet above low water, and covered with a growth of small trees from 1 to 6 inches in diameter, mostly willow. The lot is not valuable when compared with the land of the adjacent shores. In my opinion the public interests will be best served by establishing the lines as laid down at both these places, omitting lines around lot 10, section 5. It is particularly important to preserve as great a section for high water at the Wabasha Street Bridge as now obtains.

It has been thought better to send a map on small scale, showing the location of the harbor lines, for the approval of the Secretary of War, rather than copies of the five sheets on a large scale. These latter sheets are in detail, and should be retained in this office for future use, as reference to them will be necessary from time to time in connection with improvements on shore. A copy of the small map will probably be sufficient for use at the War Department. This map<sup>a</sup> is on a scale of 1 inch to 400 feet, and is forwarded in separate package. On it are shown in red the proposed harbor lines extending from the Chicago, St. Paul, Minneapolis and Omaha Railway bridge along the southerly shore to Annapolis street, the lower city limits, and along the northerly shore to a point near Dam 18, below which point it is thought there is no urgent need of a harbor line at present, also around Harriet Island and Raspberry Island. The harbor lines as laid down are at the elevation of low water, 1864.

The part of the harbor line along the northerly bank from the Chicago Great Western bridge to Phalen Creek coincides with the line out to which filling by the St. Paul Union Depot Company and the Chicago, Milwaukee and St. Paul Railway Company has been authorized by the Secretary of War under dates of May 27, 1901, and November 16, 1901. Under this latter authority it is provided that the mouth of Phalen Creek shall be left open.

I now have the honor, in accordance with provisions of section 11 of the river and harbor act of March 3, 1899, to submit for the action of the Secretary of War the harbor lines as laid down on the accompanying map and recommend their adoption. I respectfully request that, in the event of approval, the map may be returned to me to have placed upon it the proper references and descriptions by which the lines may be definitely located.

Very respectfully, your obedient servant,

C. MCD. TOWNSEND,  
*Major, Corps of Engineers.*

Brig. Gen. G. L. GILLESPIE,  
*Chief of Engineers, U. S. A.*

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<sup>a</sup> Not printed.



## DESCRIPTION OF THE HARBOR LINE FOR THE MISSISSIPPI RIVER AT ST. PAUL, MINN.

For the southerly or right shore: Beginning at a point on the center line of the Chicago, St. Paul, Minneapolis and Omaha Railway bridge crossing the Mississippi River, west of Richmond street, 30 feet northerly from a copper bolt leaded horizontally in the northerly face of the right shore pier of said bridge; thence northeasterly in a straight line to a point in the prolongation northwesterly of the southwesterly line of block 1 of Cox's second addition to St. Paul 105 feet from the northwest corner of said block 1 as marked by city monument No. 2832, set at said corner; thence northeasterly in a straight line to a point in the prolongation northerly of the easterly line of block 1 of Cox's second addition to St. Paul 145 feet from the northeast corner of said block 1 as marked by city monument No. 2833, set at said corner; thence northeasterly in a straight line to a point 123 feet northwesterly from the prolongation southwesterly of a line as the same is monumented by city monument No. 518, set on the east line of section 12, township 28, range 23 west of the fourth P. M. and city monument No. 519, said line being parallel with and 33 feet northwesterly from the northwesterly line of block 1 of Langevin's fourth addition to St. Paul, said point being in a line at right angles to the prolongation of said monumented line measured from a point 276 feet southwesterly from said city monument No. 518; thence northeasterly in a straight line to a point 106 feet northwesterly from aforesaid line as the same is monumented by city monuments No. 518 and No. 519, said point being in a line at right angles to said monumented line measured from a point 212 feet southwesterly from said city monument No. 519; thence northeasterly in a straight line to a point on the center line of the Smith Avenue Bridge, 86 feet northwesterly from the line of the northwesterly face of the capstones under the granite blocks of the large pedestals of the bridge nearest the river; thence northeasterly in a straight line to a point in the southwesterly line of block 205 of Irvine's addition to west St. Paul 90 feet northwesterly from the southern corner of said block 205 as marked by city monument No. 2834, set at said corner; thence northeasterly in a straight line to a point in the northeasterly line of block 191 of Irvine's addition to west St. Paul 90 feet northwesterly from the eastern corner of said block 191 as marked by city monument No. 442, set at said corner; thence northeasterly in a straight line to a point in the prolongation northwesterly of the northeasterly line of block 183 of Robertson's addition to west St. Paul 390 feet from the eastern corner of said block 183 as marked by city monument No. 2835, set at said corner; thence northeasterly in a straight line to a point on the center line of the Wabasha Street Bridge 20 feet northwesterly from the line of the northwesterly face of the capstones under the granite blocks of the bridge pedestals; thence northeasterly in a straight line to a point on the center line of the Robert Street Bridge 78 feet northwesterly from a copper bolt leaded horizontally in the northwesterly face of the right shore pier of said bridge, said copper bolt being approximately 170 feet northwesterly from the northern corner of block 2 of Bazille & Roberts addition to west St. Paul; thence northeasterly in a straight line to a point in the prolongation northwesterly of the northeasterly line of block 6 of Marshall's addition to west St. Paul 240 feet from the northeastern corner of said block 6 as marked by city monument No. 450, set at said corner; thence northeasterly in a straight line to a point in the prolongation northwesterly of the southwesterly line of block 16 of Dunwell & Spencer's addition to west St. Paul 272 feet from the southwestern corner of said block 16 as marked by city monument No. 2836, set at said corner; thence easterly in a straight line to a point in the prolongation northwesterly of the northeasterly line of block 29 of said Dunwell & Spencer's addition 182 feet from the intersection of the northeasterly line of said block 29 and the center line of the alley running southwesterly through said block 29 as marked by city monument No. 453, set at said point of intersection; thence easterly in a straight line to a point 198 feet northerly from the city levee line as the same is monumented by the last-mentioned city monument No. 453 and the city monument No. 458, said point being on Dam 29 and in a line at right angles to the said levee line measured from city monument No. 2837, set 526 feet westerly from the northwest corner of block 19 of Amb's addition to west St. Paul as marked by city monument No. 458, set at said corner; thence easterly in a straight line to a point in the prolongation north of the west line of block 19 of Amb's addition 140 feet from the northwest corner of said block 19; thence southeasterly in a straight line to a point in the prolongation north of the west line of block 17 of the aforesaid Amb's addition 182 feet from the northwest corner of said block 17 as marked by city monument No. 2838, set at said corner; thence southeasterly in a straight line to a point in the prolongation north of the west line of block 18 of the aforesaid Amb's addition 175 feet from the northwest corner of said block 18 as marked by city monument No. 2839, set at said corner; thence southeast-

erly in a straight line to a point in the prolongation north of the east line of block 18 of the aforesaid Amb's addition 154 feet from the northeast corner of said block 18 as marked by city monument No. 459, set at said corner; thence southeasterly in a straight line to a point 240 feet northeasterly from the city levee line as the same is monumented by the last-mentioned city monument No. 459 and by city monument No. 522, set on the northeasterly line of lot 14, block 3, of Langevin's third addition to St. Paul, said point being on Dam 31, and in a line at right angles to said levee line measured from city monument No. 2840, set 433 feet northwesterly from the aforesaid city monument No. 522; thence southeasterly in a straight line to a point 240 feet northeasterly from the last-mentioned city monument No. 522, and in a line making an angle of  $92^{\circ} 34'$  with the city levee line as the same is monumented by said city monument No. 522 and by city monument No. 523, set on the northerly line of lot 23 of block 2 of Langevin's third addition to St. Paul; thence southeasterly in a straight line to a point 240 feet northeasterly from the last-mentioned city monument No. 523 and in a line making an angle of  $92^{\circ} 05'$  with the city levee line as the same is monumented by said city monument No. 523 and city monument No. 524, set on the center line of Colorado street; thence southeasterly in a straight line to a point 220 feet northeasterly from the last-mentioned city monument No. 524 and in a line making an angle of  $98^{\circ} 05'$  with the city levee line as the same is monumented by said city monument No. 524 and city monument No. 150, set on the center line of Delos street; thence southeasterly in a straight line to a point 220 feet northeasterly from the last-mentioned city monument No. 150 and in a line making an angle of  $94^{\circ} 33'$  with the city levee line as the same is monumented by said city monument No. 150 and city monument No. 525, set on the center line of Queen street; thence southerly in a straight line to a point 220 feet easterly from the last-mentioned city monument No. 525 and in a line making an angle of  $100^{\circ} 04'$  with the city levee line as the same is monumented by said city monument No. 525 and city monument No. 526, set on the easterly line of lot 10, block 4, of Campbell's addition to St. Paul; thence southerly in a straight line to a point 220 feet easterly from the last-mentioned city monument No. 526 and in a line making an angle of  $95^{\circ} 30'$  with the city levee line as the same is monumented by said city monument No. 526 and city monument No. 2841, set at the southeast corner of block 5 of Campbell's addition to St. Paul; thence southerly in a straight line to a point in the prolongation easterly of the southerly line of block 5 of said Campbell's addition 220 feet from the southeast corner of said block 5 as marked by the last-mentioned city monument No. 2841; thence southerly in a straight line to a point 240 feet easterly from city monument No. 528, set on the easterly line of lot 7, block 54, of the West St. Paul Real Estate and Improvement Syndicate addition No. 4 of St. Paul, and in a line making an angle of  $84^{\circ} 17'$  with the city levee line as the same is monumented by said city monument No. 528 and city monument No. 529, set on the easterly line of lot 4, block 53, of aforesaid addition No. 4; thence southerly in a straight line to a point 220 feet easterly from the last-mentioned city monument No. 529 and in a line making an angle of  $83^{\circ} 25'$  with the city levee line as the same is monumented by said city monument No. 529 and city monument No. 186, at Annapolis street, which monument is set on the south line of section 9, township 28, range 22 west of the fourth P. M.; thence southerly in a straight line to a point 225 feet east from the last-mentioned city monument No. 186.

For the northerly, or left shore: Beginning at a point off the center line of the Chicago, St. Paul, Minneapolis and Omaha Railway bridge crossing the Mississippi River, west of Richmond street, 20 feet southerly from a copper bolt leaded horizontally in the southerly face of the left shore abutment of said bridge; thence northeasterly in a straight line to the point of intersection of the west line of Western avenue produced south with a line parallel with and 110 feet southeasterly from the city levee line as the same is monumented by city monument No. 554, set at the northwest corner of Western avenue and James street, and city monument No. 553, set at the southeast corner of lot 14 of partition plat; thence northeasterly parallel with the last-named levee line to an intersection with a line parallel with and 110 feet southeasterly from the city levee line as the same is monumented by the last-mentioned city monument No. 553 and city monument No. 552, set at the southeast corner of lot 16 of partition plat; thence northeasterly parallel with last-named levee line to an intersection with a line parallel with and 110 feet southeasterly from the city levee line as the same is monumented by the last-mentioned city monument No. 552 and city monument No. 551, set at the southeast corner of block 7 of Kinney, Bond & Trader's addition to St. Paul; thence northeasterly parallel with last-named levee line to an intersection with a line parallel with and 110 feet southeasterly from the city levee line as the same is monumented by the last-mentioned city monument No. 551 and city monument No. 139, set 30 feet west of the southeast corner of section 1, township 28, range 23 west of

the fourth P. M.; thence northeasterly parallel with last-named levee line to an intersection with a line parallel with and 110 feet southeasterly from the city levee line as the same is monumented by the last-mentioned city monument No. 139 and city monument No. 548, set at the southeastern corner of block 49 of Rice & Irvine's addition to St. Paul; thence northeasterly parallel with last-named levee line to an intersection with a line parallel with and 110 feet southeasterly from the city levee line as the same is monumented by the last-mentioned city monument No. 548 and city monument No. 546, set at the eastern corner of block 46 of said Rice & Irvine's addition; thence northeasterly along last-named parallel line to the point of intersection with the prolongation southeasterly of the northeasterly line of said block 46 of Rice & Irvine's addition; thence northeasterly in a straight line to a point 110 feet southeasterly from the southeasterly line of block 43 of said Rice & Irvine's addition, said point being in a line at right angles to the southeasterly line of said block 43, measured from a point 76 feet southwesterly from the east corner of said block 43, as marked by city monument No. 2842, set at said corner; thence northeasterly in a straight line to a point 77.65 feet southeasterly from the southwest corner of block 36 of St. Paul proper as marked by city monument No. 2843, set at said corner, said point being in a line at right angles to the southeasterly line of said block 36 as the same is monumented by the last-mentioned city monument No. 2843 and city monument No. 2844, set at the southeast corner of said block 36; thence northeasterly in a straight line 324.3 feet to a point, said straight line being parallel with and 30 feet southeasterly from the center line of the southerly track owned jointly by the Chicago, St. Paul, Minneapolis and Omaha Railway Company and the Chicago, Milwaukee and St. Paul Railway Company, the center line of said track being 47.63 feet from said city monument No. 2843 and 37.57 feet from said city monument No. 2844 at the southwest and southeast corners, respectively, of said block 36, both distances being measured southeasterly on lines at right angles to the southeasterly line of said block 36; thence northeasterly in a curve deflecting to the left, being tangent to the last-described straight line, and having a radius of 2,336 feet, to a point in the prolongation southeasterly of the southwesterly line of block 38 of St. Paul proper 106.8 feet from the southwest corner of said block 38 as marked by city monument No. 2845, set at said corner, said curve being parallel with and 30 feet from the center line of the aforesaid southerly track; thence northeasterly in a straight line to a point on the center line of the Robert Street Bridge, 10 feet southeasterly from a copper bolt leaded horizontally in the southeasterly face of the left shore pier of said bridge; thence northeasterly in a straight line to a point in the southwestern corner of the northern abutment of the Chicago Great Western Railway bridge, crossing the Mississippi River west of Jackson street; thence following the southeasterly face of said abutment to a point in the southeastern corner of said abutment, said point being in the prolongation southeasterly of a line marked by two copper bolts, 2 feet apart, leaded vertically in the top of the lowest step of said abutment, said point being 2 feet southeasterly from the southeasterly copper bolt; thence northeasterly in a straight line 2,279.08 feet to a point 121.29 feet southerly from United States monument No. 9 set on the prolongation southeasterly of the southwesterly line of John street, 690.82 feet from the southwest corner of the intersection of John and Third streets, said point being in a line making an angle at United States monument No. 9 of  $44^{\circ} 38'$  with the southeasterly prolongation of said southwesterly line of John street; thence easterly in a curve deflecting to the right, being tangent to the last-described straight line, and having a radius of 3,819.83 feet, a distance of 2,025 feet, more or less, to a point 194.39 feet southwesterly from the prolongation northwesterly of the boundary line between the Chicago, Milwaukee and St. Paul Railway Company and the Chicago, Burlington and Northern Railway Company as monumented by an iron monument set about 340 feet easterly from Phalen Creek and an iron monument set 1,000 feet southeasterly from first-mentioned iron monument, said point being in a line at right angles to the prolongation of said boundary line measured from a point 435.89 feet northwesterly from the first-mentioned iron monument; thence easterly in a curve deflecting to the right, being compounded at the last-described point, and having a radius of 1,653.25 feet, a distance of 579 feet, more or less, to a point 92.6 feet southwesterly from said boundary line between the Chicago, Milwaukee and St. Paul Railway Company and the Chicago, Burlington and Northern Railway Company, said point being in a line at right angles to said boundary line measured from a point 130.5 feet southeasterly from the first-mentioned iron monument; thence southeasterly in a straight line 1,310 feet, more or less, to a point 95.42 feet southwesterly from the prolongation southeasterly of the aforesaid boundary line, said point being in a line at right angles to the prolongation of said boundary line measured from a point 440 feet southeasterly from the said iron monument on said boundary line 1,000 feet southeasterly from the first-mentioned iron monument, about 340 feet easterly from Phalen Creek;

thence southeasterly in a straight line 684 feet, more or less, to a point 66 feet southwesterly from city monument No. 537, said point being in a line from said city monument No. 537 measured at right angles to a line as the same is monumented by said city monument No. 537 and city monument No. 536, set about 80 feet easterly from the root of Dam 18; thence southeasterly in a straight line 1,976 feet, more or less, to a point 70 feet southwesterly from the aforesaid line as monumented by said city monuments No. 537 and No. 536, said point being on Dam 18 and in a line at right angles to said line measured from a point 96 feet northwesterly from the last-mentioned city monument No. 536.

For Harriet Island: Beginning at a point in the prolongation northwesterly of the southwesterly line of block 190 of Irvine's addition to West St. Paul, said point being 255 feet southeasterly from United States monument No. 3, set on the prolongation northwesterly of the southwesterly line of said block 190 and 599.71 feet from the point of intersection of the prolongation northeasterly of the southeasterly line of block 191 of said Irvine's addition with the prolongation northwesterly of the said line of said block 190; thence southwesterly in a straight line to a point 242 feet southeasterly from a base line on Harriet Island as the same is monumented by the last-mentioned United States monument No. 3, by United States monument No. 1, set on the prolongation northwesterly of the southwesterly line of block 205 of Irvine's addition to West St. Paul 572.65 feet from the southern corner of said block 205 as marked by city monument No. 2834, set at said corner and 1,520.13 feet from said United States monument No. 3, by United States monument No. 2, set on said base line 200 feet northeasterly from said United States monument No. 1, and by United States monument No. 4, set on said base line 760 feet northeasterly from the aforesaid United States monument No. 3, the said point being in a line at right angles to the said base line measured from a point 556 feet northeasterly from said United States monument No. 2; thence southwesterly in a straight line to a point 100 feet southeasterly from the prolongation southwesterly of the said base line, said point being in a line at right angles to the prolongation of said base line measured from a point 210 feet southwesterly from aforesaid United States monument No. 1; thence in a curve deflecting to the right, being tangent to the last-described straight line, and having a radius of 100 feet through an arc of  $155^{\circ}$  to a point; thence northeasterly in a straight line to a point 388 feet northwesterly from the aforesaid base line, said point being in a line at right angles to said base line measured from a point 442 feet northeasterly from aforesaid United States monument No. 2; thence northeasterly in a straight line to a point 408 feet northwesterly from the said base line, said point being in a line at right angles to said base line measured from a point 696 feet northeasterly from aforesaid United States monument No. 2; thence northeasterly in a straight line to a point 46 feet northwesterly from the prolongation northeasterly of the said base line, said point being in a line at right angles to the prolongation of said base line measured from a point 542 feet northeasterly from aforesaid United States monument No. 4; thence in a curve deflecting to the right, being tangent to the last-described straight line, and having a radius of 110 feet through an arc of  $165^{\circ}$  to a point; thence southwesterly in a straight line to the point of beginning.

For Raspberry Island: Beginning at a point on the center line of the Wabasha Street Bridge 100 feet southeasterly measured on the center line of said bridge from the point of intersection of the center line of said bridge with a base line on Raspberry Island as the same is monumented by United States monument No. 5, set on the prolongation northwesterly of the northeasterly line of block 182 of Robertson's addition to West St. Paul, 891.32 feet from the northeast corner of said block 182, by United States monument No. 8, set on the prolongation northwesterly of the northeasterly line of block 4 of Bazille & Roberts's addition to West St. Paul, 1,049.8 feet from the southeast corner of said block 4, by United States monument No. 6, set on said base line 200 feet northeasterly from aforesaid United States monument No. 5 and by United States monument No. 7, set on said base line 300 feet southwesterly from aforesaid United States monument No. 8, said base line being 734.28 feet long; thence southwesterly in a straight line to a point 48 feet southeasterly from the prolongation southwesterly of the said base line, said point being in a line at right angles to the prolongation of said base line measured from a point 180 feet southwesterly from aforesaid United States monument No. 5; thence in a curve deflecting to the right, being tangent to the last described straight line, and having a radius of 70 feet through an arc of  $160^{\circ}$  to a point; thence northeasterly in a straight line to a point on the center line of the Wabasha Street Bridge 120 feet from the said base line measured northwesterly on the center line of said bridge; thence northeasterly in a straight line to a point 85 feet northwesterly from said base line, said point being in a line at right angles to said base line measured from aforesaid United States monument No. 8; thence northeasterly in a straight line to a point 20 feet northwesterly from the prolongation

northeasterly of the said base line, said point being in a line at right angles to the prolongation of said base line measured from a point 470 feet northeasterly from aforesaid United States monument No. 8; thence in a curve deflecting to the right, being tangent to the last-described straight line, and having a radius of 30 feet through an arc of 165° to a point; thence southwesterly in a straight line to the point of beginning.

City monuments referred to herein are of granite, 8 inches square on top, and about 2 feet long; the top is dressed square and has a hole three-fourths inch in diameter drilled in center. The center of the drill hole is the point of reference. United States monuments are of granite, 8 inches square on top, about 10 inches square at base, and 30 inches long; the top is dressed square, and has a hole three-fourths inch in diameter drilled in center. The center of the drill hole is the point of reference. The letters U. S. and the number of the monument are cut on top. The iron monuments marking the boundary line between the Chicago, Milwaukee and St. Paul Railway Company and the Chicago, Burlington and Northern Railway Company are of cast iron, about 3 inches square on top, and have the letters "C. M. & St. P.—C. B. & N." cast on top. The copper bolts are three-eighths inch diameter, the center being marked by a small punch hole; the copper bolts is between the letters U. S. cut in the stone.

ST. PAUL, MINN., *June 30, 1902.*

WAR DEPARTMENT, *August 20, 1902.*

Approved.

WM. CARY SANGER,  
*Acting Secretary of War.*



## APPENDIX B B.

RESERVOIRS AT HEADWATERS OF MISSISSIPPI RIVER; IMPROVEMENT OF MISSISSIPPI RIVER FROM ST. PAUL TO MINNEAPOLIS, MINNESOTA; OF RIVERS IN WISCONSIN AND MINNESOTA TRIBUTARY TO MISSISSIPPI RIVER; OF WARROAD RIVER, MINNESOTA, AND OF RED RIVER OF THE NORTH, MINNESOTA AND NORTH DAKOTA.

REPORT OF MAJ. R. L. HOXIE, CORPS OF ENGINEERS, OFFICER IN CHARGE FOR THE FISCAL YEAR ENDING JUNE 30, 1903, WITH OTHER DOCUMENTS RELATING TO THE WORKS.

### IMPROVEMENTS.

- |   |   |
|---|---|
| 1. Mississippi River between St. Paul and Minneapolis, Minnesota.   | 7. Warroad Harbor and Warroad River, Minnesota.                             |
| 2. Reservoirs at headwaters of Mississippi River, and Mississippi River between Brainerd and Grand Rapids, Minnesota. | 8. Survey of Red Lake and Red Lake River, Minnesota.                        |
| 3. Operating and care of reservoirs at headwaters of Mississippi River.   | 9. Survey of Otter Tail Lake and Otter Tail River, Minnesota.               |
| 4. St. Croix River, Wisconsin and Minnesota.  | 10. Survey of Big Stone Lake and Lake Traverse, Minnesota and South Dakota. |
| 5. Minnesota River, Minnesota.  | 11. Gauging Mississippi River at or near St. Paul, Minnesota.               |
| 6. Red River of the North, Minnesota and North Dakota.  |   |

UNITED STATES ENGINEER OFFICE,  
*St. Paul, Minn., July 17, 1903.*

GENERAL: I have the honor to submit herewith report upon the works of river and harbor improvements in my charge for the fiscal year ending June 30, 1903.

Very respectfully, your obedient servant,

R. L. HOXIE,  
*Major, Corps of Engineers.*

Brig. Gen. G. L. GILLESPIE,  
*Chief of Engineers, U. S. A.*

### B B 1.

IMPROVEMENT OF MISSISSIPPI RIVER, BETWEEN ST. PAUL AND MINNEAPOLIS, MINNESOTA.

The approved project and the report of progress of the work up to June 30, 1902, will be found in the Report of the Chief of Engineers for 1903, Part I, page 396.

## 1524 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

During the past fiscal year work has progressed upon Lock and Dam No. 2 as rapidly as permitted by the delay in receiving steel for the bear-trap gates from the contractors. Within the east side cofferdam for the lock little work remained to be done at the beginning of the fiscal year. Operations were necessarily restricted to the bear trap gates and the short section of dam within the west side coffer. This work, but for the delay of one year in completing delivery of the steel, would have been completed in the fall of 1902. The two old cofferdams would then have been removed and the third and last constructed during low water of 1902 for the completion of the remaining section of the dam. This must now be delayed until low water of the present season.

Upon Lock and Dam No. 1 work has been suspended to await the action of the Congress upon the question of increasing the limit of cost of the contemplated improvement. While this limit has not been definitely extended, ample funds have been provided for continuing the work upon Lock and Dam No. 1, and authority to proceed within the original limit of cost has been given by legislation. Operations have been resumed, preliminary work is now in progress, and plans for the lock and dam are now in course of preparation. For details of work done attention is invited to report of Assistant Engineer A. O. Powell herewith.

*Money statement.*

July 1, 1902, balance unexpended .....	\$440, 216. 89
Amount appropriated by sundry civil act approved March 3, 1903 .....	223, 579. 33
	<hr/>
	663, 796. 22
June 30, 1903, amount expended during fiscal year .....	99, 473. 21
	<hr/>
July 1, 1903, balance unexpended .....	564, 323. 01
July 1, 1903, outstanding liabilities .....	14, 114. 55
	<hr/>
July 1, 1903, balance available .....	550, 208. 46
	<hr/>
July 1, 1903, amount covered by uncompleted contracts .....	14, 957. 00
	<hr/>
Amount (estimated) required for completion of existing project .....	( <sup>a</sup> )

## ABSTRACT OF APPROPRIATIONS.

By act approved—	
August 18, 1894 .....	\$51, 000. 00
July 13, 1892 (allotted by act of August 18, 1894) .....	49, 877. 67
By act of June 3, 1896 .....	100, 000. 00
By act approved—	
March 3, 1899 .....	150, 000. 00
June 6, 1900 .....	185, 000. 00
March 3, 1901 .....	157, 000. 00
June 28, 1902 .....	250, 000. 00
March 3, 1903 .....	223, 579. 33
	<hr/>
	1, 166, 457. 00

## ABSTRACT OF CONTRACT (EMERGENCY) IN FORCE.

Name of contractor: New Jersey Foundry and Machine Company.  
Date: February 3, 1902.  
Date of beginning: February 13, 1902.  
Date of expiration: May 5, 1902.

<sup>a</sup>The amount here given is the original estimate of \$1,166,457, less the amount already appropriated, Congress not yet having authorized any increase in the limit of cost.



## COMMERCIAL STATISTICS.

There has been no commerce over this section of the river during the year except that of drifting loose logs to market. No other kind has been possible on account of the swift current and numerous rocks and boulders.

## REPORT OF MR. R. DAVENPORT, ASSISTANT ENGINEER.

ST. PAUL, MINN., June 30, 1903.

MAJOR: The following report as to the acquisition by the United States of title and right of flowage on lands to be affected by the construction of locks and dams on the Mississippi River between Minneapolis and St. Paul is respectfully submitted:

The status of the negotiations for flowage for Lock and Dam No. 1 remains the same as reported June 30, 1902, Appendix X, Report of the Chief of Engineers, pages 1671-1672.

For Lock and Dam No. 2 title or right of flowage has been obtained on all land to be affected, except in the case of a vacated street in the "town of Minneapolis," where the ownership of tract is undetermined.

In accordance with the approval of the Secretary of War, July 27, 1900, and the letter of the Attorney-General of the United States to the United States attorney, district of Minnesota, August 4, 1900, description and maps of the tracts of land recommended to be condemned for flowage rights for the locks and dams were submitted to the United States attorney, district of Minnesota, September 30, 1901, but as far as is known in this office the proceedings for condemnation have not as yet been commenced.

Very respectfully, your obedient servant,

R. DAVENPORT,  
*Assistant Engineer.*

Maj. R. L. HOXIE,  
*Corps of Engineers.*

## REPORT OF MR. A. O. POWELL, ASSISTANT ENGINEER.

ST. PAUL, MINN., June 30, 1903.

MAJOR: I have the honor to submit a report of operations upon the improvement of the Mississippi River between Minneapolis and St. Paul during the fiscal year ending June 30, 1903:

## CONDITIONS AT BEGINNING OF THE YEAR.

At the close of the fiscal year 1902 the lock had been practically completed except some minor work on the lock gates, the erection of permanent coffer in tail bay, and the installation of power for maneuvering the lower lock gate, also the removal of the lock cofferdam.

A cofferdam had been built on the west end to inclose 138 feet of the roll dam and the two sluices each 50 feet in width. The excavation within this inclosure was well advanced and the foundation work commenced. The river was allowed to pass in a space 310 feet wide intervening between the lock cofferdam on the east side of the river and the coffer dam on the west side of the river. A description of the work in progress was given in the Annual Report for 1902.

At Lock and Dam No. 1 nothing had been done except surveys, borings, and the procurement of land titles and flowage privileges.

## OPERATIONS DURING THE PAST FISCAL YEAR.

## LOCK AND DAM NO. 2.

The heel and quoin blocks of the lower lock gate were placed in position, as well as the emptying valves, sheaves, and chains for maneuvering the gates. The filling valves and permanent coffer in lower tail bay were installed.

## DAM NO. 2.

By the close of the year the work inside of the cofferdam inclosure at the west end of the dam was almost finished. There remains but about six weeks' work when the

## 1526 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

cofferdam may be removed and the water turned through the sluices. The work consisted in a large quantity of excavation, the construction of apron crib, two concrete piers, one concrete abutment, and of concrete foundation for bear-trap sluice gates, the assembling of the gates, and the near completion of 87 feet of the roll dam to elevation 730.50. The crest of the roll dam when completed will be 737.50, but the upper 7 feet of the superstructure will not be erected until the dam is finally completed in order to leave additional passageway for flood waters while building the dam in the intervening gap between the two present cofferdams.

The work during the past year has been delayed; the construction work is now no further advanced than it should have been last fall. This delay has arisen through the failure of the contractors, the New Jersey Foundry and Machine Company, of New York, to supply on time the steel work for the sluice gates. The contract called for delivery of this material in May, 1902, but the final lot was not received until June 5, 1903. The delay has directly and indirectly caused a very material increase in the cost of the lock and dam.

### CONCRETE.

There have been placed in the piers and foundation work at west end of dam 6,105.38 cubic yards of concrete. Of this quantity 695 cubic yards were made by mixing cement with gravel excavated for the foundation work. The gravel is mainly limestone of varying quality. The gravel and sand went direct to the mixer from the excavation pits. No attempt was made to sift the gravel. It is probable that the sand is somewhat in excess. The proportion of the gravel concrete was probably 1:4:6, and was used almost exclusively in the foundation work. The remaining concrete was the usual proportions of 1 part stone, 3 parts sand, and 6 parts broken granite, trap, or quartzite. Dragon and Atlas Portland cements were used.

### CUT-OFF WALL.

The cut-off wall, which extends under the upper face of the sluices and dam, and to a depth of 23 feet 3 inches below the surface of low water, was the most difficult work encountered. Springs were of frequent occurrence and necessitated constant care and watchfulness. In one place the water was so abundant that for a space of 47 feet a brick wall 8 inches thick, laid up in quick-setting cement mortar, was substituted for concrete and grout. There were used in the grouting of cut-off wall 191 barrels of pure cement and 227 barrels of 1-2 silica cement.

### TUBE MILL.

The tube mill was run at intervals between July and October, grinding 918 barrels of 1-1 silica cement and 622 barrels of 1-2.

### BEAR-TRAP SLUICE GATES.

The sluice gates are of the kind known as the reversed Parker bear trap and are similar in proportion to the gate built in the Lake Winnibigoshish Reservoir dam during 1900, and described on page 2314, Annual Report of the Chief of Engineers for 1901, except that the ones now under construction are each 50 feet long. The dimensions were given in last year's report. The gates are built of closely packed solid timbers. The hinges are forged steel, the fastenings being U-shape, gripping each timber from the upper and lower sides. The method followed has not proven to be the most economical construction. If the timbers in the gates had been separated by spaces of 2 inches, sheathed with 3-inch planks, and the hinges made of castings having planed bases and bolted directly to one face of the leaves, the construction would have been more rapid and economical.

### LOCK AND DAM NO. 1.

Initial construction work was inaugurated May 15 by commencement of a roadway down the side of the west bluff. The cofferdam for the lock was commenced the middle of June.

During the months of January and February preliminary studies were made for plans of the lock and dam.

The purchase of flowage rights has been under the direct supervision of Mr. Davenport, assistant engineer, who submits a separate report.

## EXPENDITURES.

The cash expenditures have been itemized in the following table:

*Statement of expenditures from commencement of work to June 30, 1903.*

## LOCK AND DAM NO. 2.

## Miscellaneous:

Lands, surveys, borings, water supply, etc .....	\$30,819.27
Roads, ditches, and sidetrack .....	4,041.43
Lock tender's house .....	242.69
Carpenter and blacksmith shop .....	1,588.68
Cement warehouse .....	954.77
Stone and sand bins .....	2,476.52
Clearing Government land .....	856.70
	<hr/>
	\$41,980.06

## Plant:

Cableway .....	17,899.93
Air compressor .....	18,894.88
Pumping outfit .....	4,436.60
Crushing outfit .....	2,776.80
Mixing outfit .....	1,360.46
Tube mill .....	5,000.00
Pile-driver barges .....	2,235.53
Tracks and cars .....	4,484.29
Tools .....	5,169.45
	<hr/>
	62,257.94

## LOCK NO. 2.

Cofferdam .....	20,770.60
Stopping leaks .....	7,303.43
Pumping .....	20,230.43
Excavation .....	17,420.04
Cut-off walls .....	8,009.03
Timber and iron and foundation bolts .....	35,406.41
Cement .....	36,832.67
Silica cement (exclusive of cost of materials) .....	7,776.95
Stone, granite .....	18,148.37
Breaking stone .....	4,603.41
Crushing stone .....	9,978.70
Crushed sandstone .....	4,864.82
Sand .....	7,556.47
Mixing and placing concrete .....	23,703.05
Concrete forms .....	15,595.63
Removing concrete .....	422.34
Grouting foundation, upper lock gate .....	2,997.85
Permanent subdrainage .....	4,114.39
Snubbing posts .....	200.00
Filling back of land wall .....	6,198.93
Upper lock gate .....	13,770.79
Lower lock gate .....	18,844.70
Filling valves .....	1,511.70
Permanent coffer .....	1,325.22
Guide piers .....	3,003.78
Dredging .....	82.71
	<hr/>
	290,672.42

## DAM NO. 2.

Cofferdam .....	17,191.88
Pumping .....	13,109.05
Excavation .....	15,850.43
Leaks .....	1,022.13
Cut-off walls .....	3,555.34
Round piles .....	4,596.79
Sheet piles .....	1,522.87
Timber and iron .....	25,273.41
Cement .....	18,851.74
Silica cement (exclusive of material) .....	1,927.30

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Stone.....	\$8,301.75	
Breaking stone.....	900.56	
Crushing stone.....	3,377.31	
Sand.....	708.58	
Mixing and placing concrete.....	9,990.34	
Concrete forms.....	5,107.73	
Sluice gates.....	12,828.16	
Filling dam and behind land wall.....	1,852.65	
		<u>\$145,968.02</u>

## LOCK AND DAM NO. 1.

Miscellaneous:		
Lands, surveys, borings, water supply, etc.....	15,371.33	
Roads, ditches, etc.....	419.98	
		<u>15,791.31</u>

## LOCK NO. 1.

Cofferdam.....	65.68
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## SUPERINTENDENCE AND CONTINGENCIES.

St. Paul office.....	32,309.18	
Office Chief of Engineers.....	480.00	
Office division engineer.....	137.50	
Inspection.....	5,152.21	
Watching.....	7,120.88	
Care of dredge.....	198.79	
		<u>45,398.56</u>
		<u>602,133.99</u>

Very respectfully, your obedient servant,

A. O. POWELL, *Assistant Engineer.*

Maj. R. L. HOXIE, *Corps of Engineers.*

## B B 2.

### CONSTRUCTION OF RESERVOIRS AT HEADWATERS OF MISSISSIPPI RIVER.

The approved project and report of progress of the work up to June 30, 1902, will be found in the Report of the Chief of Engineers for 1903, Part I, page 398.

The river and harbor act approved June 13, 1902, appropriates \$250,000 for reservoirs at headwaters of Mississippi River, and Mississippi River between Brainerd and Grand Rapids, Minn., for continuing improvement and for maintenance, of which \$10,000 may be expended between Brainerd and Grand Rapids. Except as so provided, this appropriation, with the unexpended balance of former appropriations, is to be expended:

For the necessary renewal and repair of Winnibigoshish, Leech Lake, and Pokegama Falls reservoirs; in making a further investigation, including an examination and survey of the Pine River and Sandy Lake reservoirs, with a view to determining whether or not it is advisable to renew and repair said reservoirs; in making a further investigation, in the discretion of the Secretary of War, which shall include an examination and survey of Willow River in Aitkin County, to determine the causes of and the means of preventing excessive floods in the river between the Government dam at Sandy Lake and Brainerd, and the effect thereof on navigation; in making full and accurate surveys of the flowage lines of Winnibigoshish, Leech Lake, Pokegama Falls, Sandy Lake, and Pine River reservoirs, and in permanently marking such lines on the ground; not to exceed seventy-five thousand dollars for the purchase of the lands or easements therein which are necessarily subject to overflow by reason of the legitimate operation of said reservoirs when completed.

There has been expended during the past fiscal year the sum of \$86,139.80.

## RENEWAL AND REPAIR.

Owing to the exhaustion of available funds, the work of reconstruction of the reservoir dams was suspended May 4, 1901, leaving Leech Lake Dam in an unfinished condition. The new appropriation became available June 13, 1902, and work was recommenced on Leech Lake Dam June 25, 1902. The work has been completed and this reservoir is again in use. Upon completion of the work at Leech Lake Dam the available plant and all remaining material that could be of use was shipped by river and rail to Pokegama Dam. The demolition of the old dam at Pokegama was carried on during the winter and spring of 1902-3, plans completed and approved for the reconstruction, the working plant necessary for carrying on operations completed, contracts made for the supply of necessary material, and the work was in readiness for pier construction at the close of the fiscal year. Details of the work done are shown in accompanying report of Assistant Engineer Thomas Robinson.

## PINE RIVER RESERVOIR.

Resumption of work on the dikes and on the reconstruction of the dam at Pine River reservoir were suspended under the terms of the act of June 13, 1902, pending further examination and survey. It was found that the resurvey already completed is sufficient for an accurate determination of flowage of this reservoir, and the examination has been limited to ascertaining the basis of objections to the continuance of the reservoir. The following communication was received October 24, 1902:

Major Hoxie, *St. Paul, Minn.*:

The undersigned, land owners, settlers on Government lands, and taxpayers, residing on lands surrounding Cross Lake and its tributary waters, do hereby most earnestly petition and request that such steps be taken by the proper authorities of the Government that will cause a speedy removal and discontinuance of the Government dam at said Cross Lake, located at or near section 20, township 137, range 27, in Crow Wing County, Minn. Our request is based upon the fact that thousands of acres of valuable land is overflowed and rendered unfit for agricultural purposes, and a removal of this dam would render all these submerged lands valuable and would be of great general benefit to the surrounding country. We would therefore most respectfully ask that said dam be removed and that we, the signers hereof, be permitted to have the free use and enjoyment of our said lands.

To this petition 37 names were appended. The following reply was sent, under date of October 24, 1902, addressed to Matt Kemp, Jenkins, Minn.:

I have to acknowledge receipt of the petition asking for the removal of the Government dam at Pine River reservoir.

Before it can receive proper consideration it will be necessary that this office be furnished with full description (location, measurements by metes and bounds, etc.) of each and every parcel or tract of land owned by the signers of the petition on which it is claimed that damage has resulted by the operation of the dam.

To this letter no reply has ever been received, nor has anything further been heard from any of the petitioners.

The private lands affected by flowage from Pine River reservoir

as determined by the original survey were valued by a commission appointed by the United States district court under petition dated August 21, 1884. The amount of the award of this commission was paid into the court January 23, 1885, and the decree of the court vested title in fee in the United States to all such lands. Over lands belonging to the State of Minnesota flowage right only was acquired. Public lands of the United States border upon other public lands reserved for flowage, and upon such public lands homesteaders have settled since the construction of the dam and probably find the flowage right of the United States irksome. Owing to inaccuracy of original survey certain claims are unpaid.

When the detail maps of the recent resurvey of Pine River reservoir were completed, showing about 1,719 acres of land subject to overflow for which compensation has not yet been made, all available information as to ownership of this land was obtained from the United States land office at St. Cloud, Minn., and this will be followed up by obtaining abstracts of title, so that ownership may be determined and compensation made as in other cases. It has not yet transpired that any such tract of land is owned by any of the petitioners above referred to.

From Pine River below the reservoir complaints have been received that the operation of logging is injurious to the grass lands bordering the stream. In so far as these complaints apply to the release of water from the reservoir, they can be satisfied by limiting the flow during the hay-making season so that the low-lying grass lands shall not be overflowed. All other troubles incident to the operations of logging must be endured. While the supply of timber holds out logging will certainly be continued, and if the Government dam were abandoned a private dam would take its place.

When a reservoir is constructed in the wilderness and a new shore line is formed, fluctuating over a vertical distance of 18 feet, as in this instance, great changes take place around the border; deadened timber and caving banks mark a belt of desolation around the former lake, fishing grounds are destroyed or shifted, and the continual change of level in the surface of the water is a source of annoyance to residents around the border. Settlers have taken up land in the vicinity of this reservoir within the last few years who are in a great measure dependent upon the logging operations which are complained of by other settlers on Pine River below the dam. Some of these would doubtless prefer to have the lake in its natural condition.

The objections urged against this reservoir are common to all and are not ordinarily predicated upon any just claim of injury. Flowage rights have been secured and proper compensation paid, except in certain cases for which provision is made. If after such rights have been paid for the United States abandons the reservoir, riparian owners will get something for nothing, and this would seem to be the underlying motive of the present objection to the maintenance of this reservoir. The question of its public utility in connection with that of the Mississippi River system has been exhaustively considered and favorably reported upon heretofore. See report of Board printed in the Annual Report of the Chief of Engineers for 1887, Part II, pages 1681-1693. No objection can be urged against this reservoir now that was not equally applicable at the inception of the project for its construction, and now that the work is completed important interests are

dependent upon it and additional reasons exist for maintenance. The completion of the dikes and the renewal of the dam should be undertaken as soon as the renewal of Pokegama dam is completed. The Pine River dam is now in very bad condition and is not trusted with a full head of water.

#### WILLOW RIVER.

An examination of Willow River has been made to determine whether sufficient holding ground could be found for a reservoir to retain the flood water of this stream. It was ascertained that the construction of a dam and dike about 6 miles in length with a maximum height of about 24 feet would create a reservoir covering an area of perhaps 20 square miles, having a capacity of 4,350,000,000 cubic feet. The average annual run-off from the adjoining areas of the Mississippi reservoir system is 4.8 inches from a total average precipitation of 26.58 inches. The Willow River basin above the site which appears to be available for this dam has an area of about 460 square miles, which is something like eighteen times the area of the reservoir. The reservoir would therefore retain all of the annual run-off if this were stored, with a mean depth of 8 feet. The land to be overflowed by such a reservoir is capable of cultivation as a high grade of farming land. The cost of the land, if condemned for public use, would probably be excessive. The total cost of the reservoir is roughly estimated at \$550,000. This is \$1,196 per square mile of drainage area and \$126 per million cubic feet of storage capacity. It is rather more than the present value of the land proposed to be protected.

A more advantageous project for an additional reservoir in the upper Mississippi system at Gull Lake, not far distant from this site, is now held in abeyance, the estimated cost being under alternative plans \$296 or \$387 per square mile of drainage, and \$30.92 or \$101 per million cubic feet capacity.

Some modification of flood discharge would necessarily result from the construction of the Willow River reservoir. The total area tributary to the Mississippi upstream from lands to be protected is about 6,045 square miles. Of this the existing reservoirs of the upper Mississippi system can impound the total run-off of 3,686 square miles. The Willow River reservoir would hold the run-off of an additional 460 square miles—in all 4,146 square miles—leaving the run-off of 1,899 square miles to pass the overflowed lands in time of freshet. The construction of the Willow River reservoir would result in holding back the run-off of 19½ per cent of the present flood-producing area and would probably reduce in the same proportion the flood discharge.

The examination of Willow River was made as part of a "further investigation to determine the causes of and the means of preventing excessive floods in the river between the Government dam at Sandy Lake and Brainerd, and the effect thereof on navigation." The original investigation was made by Major Abbot in 1899-1900; report submitted June 4, 1900, and published in House Executive Document No. 113, Fifty-sixth Congress, second session, and in the Annual Report of the Chief of Engineers for 1901, Part III, pages 2343 et seq. The subject was very fully investigated at that time, and the report is full and comprehensive. It was the opinion of Major Abbot

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that the overflow of the lands of which the protection was contemplated was not at that time, and would not be in the future, injurious to the interests of navigation, and that the cost of protecting the 100,000 acres of land exposed to overflow would exceed the value of the land, with excessive cost of maintenance thereafter. In this opinion I concur. The examination of Willow River was made by Assistant Engineer A. O. Powell, whose report is herewith.

### SANDY LAKE RESERVOIR.

Further investigation is to be made under the act of June 13, 1902, with a view to determining whether or not it is advisable to renew and repair the Sandy Lake reservoir. This act further requires a full and accurate survey of the flowage line of the reservoir. The field work for the latter purpose will be commenced as soon as that of Leech Lake and Lake Winnibigoshish is completed—early in the present working season—and the required investigation will be made at the same time. The dam at Sandy Lake reservoir is still in good condition and renewal will not be required for several years.

### SURVEYS.

The resurvey of the reservoirs was suspended September 20, 1900, because of exhaustion of the appropriation. The new appropriation became available June 13, 1902, and the survey parties in two principal divisions took the field during the following month and have been continuously occupied to the close of the fiscal year. The field work of resurvey of the reservoirs at Leech Lake and Lake Winnibigoshish, Pokegama Lake, and Pine River has been nearly completed and the final maps are in course of preparation. This is all that was contemplated in the original estimate for such work, but the act of June 13, 1902, adds to this the resurvey of Sandy Lake reservoir. A party will take the field for the latter work this summer. The cost of the resurvey of the reservoirs will exceed the original estimate because of this addition to the work and because of the great difficulty of making a cadastral survey in the swamps of this region. The original estimate of total cost was \$30,000; the present estimate is \$90,000.

The object of these resurveys is to determine the exact status of lands bordering the reservoirs with a view to the settlement of all unsettled claims for damages. Such settlement is provided for by appropriation and is effected by condemnation or otherwise after the completion of the maps of survey and the ascertainment of ownership. The present status of this question is shown in the accompanying report of Assistant Engineer R. Davenport.



*Total expenditure from appropriation for construction of reservoirs since July 1, 1898, when the cadastral surveys and the renewal of the old dams were begun.*

<b>Contingencies:</b>		
Main office .....	\$17,098.65	
Inspection .....	1,825.62	
Road between Lake Winnibigoshish and Leech Lake dams .....	684.53	
Examination of Long Prairie River .....	32.42	
Examination of Willow River .....	3.00	
		<b>\$19,644.22</b>
<b>Surveys:</b>		
Plant .....	4,265.82	
Pine River reservoir .....	2,886.67	
Pokegama Falls reservoir .....	9,428.38	
Leech Lake reservoir .....	24,142.89	
Lake Winnibigoshish reservoir .....	31,126.03	
Sandy Lake reservoir .....	364.64	
At Aitkin .....	877.94	
Below Pokegama .....	714.97	
		<b>73,807.34</b>
<b>Lands, easements, etc.:</b>		
Below Pokegama .....	1,254.34	
Above Pokegama .....	8,586.36	
		<b>9,840.70</b>
<b>Pine River reservoir:</b>		
Dikes 1, 3, 4, and 14 .....	9,070.24	
Damage caused by crevasse June 17, 1896 .....	1,733.00	
		<b>10,803.24</b>
<b>Pokegama Falls reservoir, booms .....</b>		<b>151.21</b>
<b>Reconstruction of Lake Winnibigoshish dam:</b>		
Minor buildings .....	2,993.69	
Plant .....	9,212.14	
Cofferdam .....	16,301.40	
Embankments .....	10,380.42	
Repairs to old foundations .....	23,213.29	
Concrete .....	47,701.70	
Cement house .....	2,311.22	
Log sluice gate .....	11,366.75	
Tainter gates .....	15,751.53	
Piers and booms above dam and embankment .....	5,029.41	
		<b>144,261.55</b>
<b>Reconstruction of Leech Lake dam:</b>		
Repairs to buildings .....	1,194.79	
Miscellaneous .....	2,840.42	
Plant .....	7,350.83	
Cofferdams .....	13,080.19	
Removal of old dam .....	2,013.05	
Repairs to old foundation .....	14,605.98	
Concrete .....	21,519.54	
Stop plank and hoisting gear .....	1,963.50	
Embankments .....	3,861.40	
Bridge over dam .....	565.83	
		<b>68,995.53</b>
<b>Reconstruction of Pokegama Falls dam:</b>		
Excavation .....	190.00	
Embankments .....	60.75	
Cofferdam .....	6,634.51	
Tainter gates .....	62.53	
Plant .....	3,618.43	
Concrete .....	11,319.62	
Removal of old dam .....	6,373.66	
Repairs and alterations to buildings .....	3,592.88	
Repairs to old foundation .....	195.89	
Miscellaneous .....	408.58	
		<b>32,456.85</b>
<b>Total .....</b>		<b>359,960.64</b>

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## Money statement.

July 1, 1902, balance unexpended .....	\$250,307.85
June 30, 1903, amount expended during fiscal year .....	86,139.80
July 1, 1903, balance unexpended .....	164,168.05
July 1, 1903, outstanding liabilities.....	9,201.89
July 1, 1903, balance available .....	154,966.16
July 1, 1903, amount covered by uncompleted contracts.....	15,700.00
{ Amount (estimated) required for completion of existing project .....	<sup>a</sup> 205,000.00
{ Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903 .....	205,000.00
{ Submitted in compliance with requirements of sundry civil act of June 4, 1897.	

## ABSTRACT OF APPROPRIATIONS.

By act—		By act—	
Approved June 14, 1880.....	\$75,000	Approved July 13, 1892..	\$60,000
Approved March 3, 1881 ...	150,000	Of August 18, 1894.....	51,000
Passed August 2, 1882.....	300,000	Passed June 3, 1896.....	80,000
Approved July 5, 1884.....	60,000	Approved March 3, 1899..	210,000
Approved August 5, 1886....	37,500	Approved June 13, 1902..	250,000
Of August 11, 1888.....	12,000		
Approved September 19, 1890.....	80,000		1,365,500

## ABSTRACT OF CONTRACTS (EMERGENCY) IN FORCE.

Name of contractor.	Date.	Date of beginning.	Date of expiration.
St. Paul Foundry Co.....	Mar. 27, 1903	Apr. 6, 1903	<sup>b</sup> Sept. 1, 1903
J. H. Webster, assignee of The Variety Iron Works Co.....	Apr. 16, 1903	Apr. 26, 1903	Do.

## REPORT OF MR. THOMAS ROBINSON, ASSISTANT ENGINEER.

GRAND RAPIDS, MINN., July 9, 1903.

MAJOR: I have the honor to submit reports of operations on the reconstruction of Leech Lake and Pokegama Falls dams, headwaters of Mississippi River, during the fiscal year ending June 30, 1903.

### LEECH LAKE DAM.

After a shut-down of about one year from lack of funds, operations were resumed, and on the 1st of July, 1902, the work was well under way. The plant was already in place, and so the methods of previous years for handling materials and mixing and placing concrete were followed. These were all described in the Annual Report of the Chief of Engineers for 1901, and a further description is deemed unnecessary.

After repairs were made to buildings and plant the masonry work was resumed by placing concrete in the fifteenth pier and continued until the remaining twenty-five channel and the north abutment piers were completed. Two rows of sheet piling of

<sup>a</sup> Required for work as contemplated in river and harbor acts approved March 3, 1899, and June 13, 1902.

<sup>b</sup> Extended twenty days.

6 by 12 inch timber were then driven to connect the abutment with the diaphragms of the north dike; the end of the dike was then filled with clay and sand, and its slopes were protected with riprap below and a surfacing of meadow sods above the water line. The top of the dike, across the meadow, had settled a little, and a surfacing of sandy loam, ranging from 6 inches to a foot in thickness, was placed upon its top for a distance of 3,000 feet.

The south bank of the river, around the abutment, was graded and strengthened; the cofferdam was removed; five boom piers, each 16 feet square and 12 feet high, and three booms, each 140 feet long and 4 feet wide, were built; the stop planks of the sluices were all overhauled and partly renewed; a timber wagon bridge having a clear road width of 8 feet was built across the dam, and the plant was dismantled and made ready for transportation. In all these the methods were simple and require no description.

\* \* \* \* \*

#### DESCRIPTION OF LEECH LAKE DAM.

As rebuilt the Leech Lake Dam embraces the old earthwork dike and a simple structure of rectangular concrete blocks erected upon the pile foundation of the earlier timber dam. The masonry portion of the work is 468 feet long over all and 448 feet between faces of abutment. The two abutment piers are each 56 feet long, 15 feet high, and 10 feet thick in the main and taper by jogs toward top and ends. The channel piers—except those on each side of the log sluice, which are 16 feet long and 6 feet thick—are 15 feet long, 12 feet high, and 5 feet  $1\frac{1}{2}$  inches thick. The log sluice is 12 feet and each of the other 39 sluices 6 feet wide. The gates of the sluices are composed of stop planks and are all handled without machinery, except those of the log sluice, where two single-gear winches are required.

The fishway, occupying the ninth sluice from the south end of the dam, is a modification of the Cail system, and is made by prolonging the piers at reduced height and thickness 25 feet downstream. The floor of the dam is of Oregon fir and projects as an apron 26 feet beyond the line of the downstream ends of the piers. The floor of the log sluice, to prevent gouging while logs are passing, is lined for 20 feet of its length with 30-pound railway iron.

Across the dam and resting directly upon the tops of the piers is a bridge of 8 feet clear roadway, built of 6 by 12 inch Oregon fir stringers and 3 by 12 inch Norway pine flooring and protected by suitable side railings and wheel guards.

The ends of the dam at their junctions with bank and dike are carried well into the earthwork, whose slopes are protected against wave and wind action by a dressing of riprap and sodding. \* \* \*

#### POKEGAMA FALLS DAM.

During the months of October and November, 1902, 50 tons of boilers, engines, machinery, and tools, and 150,000 feet B. M. of second-hand lumber, but all good and practically serviceable as new, were brought down the river from Leech Lake to Pokegama, and work was started on repairs to the old quarters and workshops, which were badly out of order and had to be practically renewed on roofs and in foundation timbers. As soon as the buildings were in shape work of removing the old dam was begun. This work, necessarily done in the winter, was tedious and costly. The timber and rock ballast were largely frozen to a solid mass, which had to be moved piecemeal by pick, ax, and bar. The rocks from the old dam and others gathered from the reservation, together with those found later in the spoil bank, were first broken by hammers to proper size and crushed for use in concrete. A substantial building 56 by 40 feet, and covered with corrugated galvanized iron, was erected for the double purpose of cement shed and permanent storehouse after the dam is completed.

The old concrete plant was repaired and set up substantially as it was on former works.

For the delivery of materials at the works the Great Northern Railway put in a spur 300 feet long from their main line. The ties for this work were furnished by the United States.

As soon as the ice had left the river the cofferdam (of ordinary post, rail, and sheeting timber, tied with  $1\frac{1}{2}$ -inch rods and filled with sand and clay) was built, inclosing an area of 130 by 105 feet—large enough for the erection of six channel piers and the north abutment. This basin was pumped out, the remains of the old dam were cleared away, an excavation of 270 cubic yards of quartzite rock was made for a recess under the new log sluice, and the floor of the dam was repaired preparatory to the setting of the new piers.

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Stone in the form of granite boulders, sand, cement, fuel, and lumber have been received. The concrete forms are partly set up, and at the close of the fiscal year the work is ready for the building of the piers.

\* \* \* \* \*

Very respectfully, your obedient servant,

THOMAS ROBINSON, *Assistant Engineer.*

Maj. R. L. HOXIE, *Corps of Engineers.*

## REPORT OF MR. A. O. POWELL, ASSISTANT ENGINEER.

ST. PAUL, MINN., *June 30, 1903.*

MAJOR: I have the honor to submit herewith a report upon an examination of Willow River, Itasca County, Minn., made by me in compliance with your verbal instructions and in conformity with a provision in the Mississippi River reservoir item of the river and harbor act approved June 13, 1902. Said provision reads:

"In making a further investigation, in the discretion of the Secretary of War, which shall include an examination and survey of Willow River, in Aitkin County, to determine the causes of and the means of preventing excessive floods in the river (Mississippi) between the Government dam at Sandy Lake and Brainerd and the effect thereof on navigation."

\* \* \* \* \*

Before leaving St. Paul for Willow River all the information available in this office was collected and given consideration. Messrs. Warren Potter and F. W. Shook, of Aitkin, Minn., who have been prominent in the agitation for flood prevention, were advised by letter that I would be in Aitkin on the evening of June 26, and that I would be glad to receive suggestions from them and a description of any means they had in view for preventing excessive floods. Neither of the gentlemen called on me. My examination was made June 27 to June 30 by driving through the country from Aitkin to Grand Rapids, with an excursion on foot through the swamps, and also by interviewing cruisers, hunters, and settlers upon the topography of the land within the drainage area of Willow River. There are no natural reservoir basins on the river, except at the extreme sources where it would be of no avail to construct reservoirs for the prevention of floods on the Mississippi. It was apparent that a reservoir on Willow River, to be of service, must be located as near the mouth as practicable. A tentative site was chosen on the south line of T. 51 N. which would control 80 per cent of the drainage area, or 464½ square miles. The records from the reservoir dams at the headwaters of the Mississippi River give the average annual run-off of streams in that section of the State as 0.3 of a cubic foot per second per square mile of drainage area. Upon this basis Willow River above the proposed dam site would furnish an annual average run-off of 4,350,000,000 cubic feet. The maximum run-off for a wet year would be twice that quantity, but as the reservoir would be operated solely for the prevention of floods below the dam it should have a capacity sufficient to hold one flood volume, which would be practically equivalent to the mean annual run-off.

The reservoir would be created by building a dam perhaps 20 or 24 feet high and flooding from 16 to 25 square miles of land rich in agricultural possibilities. Major Abbot estimated the flooded areas on the Mississippi from Willow River to Pine Knoll, 8 miles below Aitkin, at 100,000 acres. From Sandy Lake south to Willow River, and from Pine Knoll south to Brainerd the quantity of overflowed land is comparatively small. It will be noted that a reservoir on Willow River would necessitate the flooding of 16 to 25 per cent as much land as the total area injuriously affected below Willow River, and, furthermore, the Willow River reservoir would only partially protect the lands sought to be benefited. The topography of Willow River is unfavorable for the economical construction of a reservoir. The embankment approaches to a dam may reach 6 miles in length and the improvement cost:

Land damages, 20 square miles, or 12,800 acres, at \$10 .....	\$128,000
Dam .....	150,000
Embankments .....	222,000
	<hr/>
Contingencies .....	500,000
	50,000
Total .....	<hr/>
	550,000

My examination was made without the aid of an instrument, and when the difficulty of judging elevations through thickly wooded swamps is considered, it will be seen that my estimate is a rough approximation only, but sufficiently accurate to show the magnitude of the undertaking. To fully report upon the cost of a reservoir on the Willow River will require a survey at an expense of \$10,000.

Since the year 1900 lands in this vicinity have doubled, and in most cases trebled, in value. Major Abbot gave their value as \$5 per acre; they are now worth from \$10 to \$15, and between the Willow and Mississippi Rivers lands which sold three years ago for \$3 now sell for from \$10 to \$12 per acre. The tracts which would be overflowed by the construction of a reservoir are fully as valuable as those submerged by the overflow from the Mississippi and comprise the richest soil in Aitkin County. That portion of Aitkin County north of Aitkin is a semiwilderness, but the productive soil is attractive to settlers. When transportation facilities become available this district will form a prosperous farming community.

\* \* \* \* \*

Very respectfully, your obedient servant,

A. O. POWELL, *Assistant Engineer.*

Maj. R. L. HOXIE, *Corps of Engineers.*

#### REPORT OF MR. R. DAVENPORT, ASSISTANT ENGINEER.

ST. PAUL, MINN., *June 30, 1903.*

MAJOR: The following report respecting the lands affected by flowage from the reservoirs at the headwaters of the Mississippi River is respectfully submitted.

With the exception of the lands overflowed or affected by the Pine River Reservoir, the status of the investigation as to the ownership of the reservoir lands remains the same as in the report submitted in Appendix X, pages 1674-1675, Annual Report of the Chief of Engineers for 1902.

The field work of the resurvey of Lake Winnibigoshish Reservoir was completed early in June of this year, and the field work of the resurvey of the Leech Lake Reservoir is expected to be finished next month; the continuation of the investigation of the ownership of the lands is now awaiting the completion of the maps of the resurvey.

Pine River Reservoir was originally surveyed in 1880 and 1884, and on all lands then shown to be overflowed or affected right of flowage was secured by the United States either by quitclaim deed or condemnation, in the latter case the United States acquiring title in fee.

The resurvey of Pine River Reservoir was commenced in 1897 and was completed in 1899. The resurvey determined the location of the flowage line, elevation 1,236.7, and also that of the high contour, elevation 1,240, the latter having been entirely omitted in previous examinations.

The completion of the maps of the resurvey and the accurate determination of the location and areas of all of the lands on which the United States has previously acquired title or flowage right develops the fact that there still remains 192 tracts of land within the high contour limit, estimated to contain 1,719.5 acres, on which right of flowage or other title is still to be acquired. Of this area 1,324.5 acres are directly affected by the reservoir flowage, and 395 acres, between the flowage line and the high contour, are estimated to be more or less injuriously affected by the reservoir flowage.

The United States land office in which these lands are located supplies the following information as to the ownership of the tracts of land in question:

	Tracts.	Acres.
Patented to private parties .....	54	472.9
State of Minnesota, State swamp indemnity school lands, etc.....	4	32.4
Homestead entry .....	7	53.4
Patented to Northern Pacific R. R. Co. ....	121	1,107.8
Lands withdrawn for reservoir purposes .....	2	31.4
Vacant land of the United States .....	1	7.8
Tracts of land omitted from original United States land surveys .....	3	13.8
Total.....	192	1,719.5

<sup>a</sup> Withdrawal not of record in this office.

## 1538 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

In addition to the right of flowage above noted as required by the United States, the title to the lands required for the 17 dikes constructed and proposed for this reservoir is still to be acquired. The dikes aggregate 9,890 linear feet, and, when all are completed, will occupy some 27.3 acres of land, of which land the status of ownership, as far as it can now be determined, is as follows:

Supposed owner of land.	Linear feet of dike.	Approximate acreage.
State of Minnesota.....	2,300	6.4
Patented to private parties.....	1,560	4.3
Homestead entry.....	300	.8
Patented to Northern Pacific Rwy. Co.....	4,900	13.5
Reserved for reservoir purposes.....	830	2.3
Total.....	9,890	27.3

On the State lands here noted as occupied or required for dikes the United States has right of flowage only, under act of legislature of the State of Minnesota approved June 18, 1881. On lands reserved for reservoir purposes, though opened to homestead entry by act of Congress approved June 20, 1900, the right is reserved by the United States to construct and maintain dams, etc.

On lands noted as patented to private parties, taken under homestead entry, and patented to the Northern Pacific Railway Company title or right to occupy the land has not been obtained.

The reported ownership of all the lands here noted is based upon the records of the United States land office. As numerous transfers may have been made by the owners, the true status of the ownership at this time can only be arrived at by obtaining abstracts of title to all of the lands in question.

Very respectfully, your obedient servant,

R. DAVENPORT, *Assistant Engineer.*

Maj. R. L. HOXIE, *Corps of Engineers.*

### B B 3.

#### OPERATING AND CARE OF RESERVOIRS AT HEADWATERS OF MISSISSIPPI RIVER.

Lake Winnibigoshish reservoir was in operation during the past fiscal year, reconstruction having been completed. The reconstruction of Leech Lake reservoir was completed about October 31, 1902, and from that time this reservoir has also been in operation. The work of reconstructing the dam at Pokegama Falls reservoir was commenced about November 1, 1902, and from that time to the present this reservoir has not been in operation.

The effect of the reservoir system when all are in operation is to increase the stage of water in the Mississippi River at St. Paul during the low-water period, in late summer and fall, by 12 to 18 inches.

During the year minor repairs were made to the telephone line between Lake Winnibigoshish and Leech Lake dams, also to that between Sandy Lake Dam and McGregor, Minn.

The road between Leech Lake Dam and Bena was repaired. A new house for use of dam tenders at Leech Lake Dam was commenced, and at the close of the fiscal year was about three fourths completed.

Expenditures, exclusive of outstanding liabilities, to June 30, 1903..... \$168,512.25  
Amount expended during fiscal year ending June 30, 1903, exclusive of  
outstanding liabilities..... 10,854.63

*Distribution of liabilities incurred during fiscal years 1898-1903.*

	1898.	1899.	1900.	1901.	1902.	1903.
<b>Pokegama Falls Dam:</b>						
Operating .....	\$1,697.42	\$1,704.08	\$1,804.23	\$1,704.85	\$1,640.28	\$887.79
Repairs .....	144.62		337.45			
Land condemnation .....	207.40					
Total .....	2,049.44	1,704.08	2,141.68	1,704.85	1,640.28	887.79
<b>Leech Lake Dam:</b>						
Operating .....	1,251.02	1,154.45	1,364.11	875.20	1,275.68	909.65
Repairs .....	163.95				9.45	
Buildings .....						3,000.00
Total .....	1,414.97	1,154.45	1,364.11	875.20	1,285.13	3,909.65
<b>Lake Winnibigoshish Dam:</b>						
Operating .....	1,734.67	966.10	435.72	722.42	803.33	1,622.25
Repairs .....	158.41		a5,384.12	b3,517.70	c2,088.31	
Buildings and grounds .....				1,587.37	640.74	
Total .....	1,893.08	966.10	5,819.84	5,827.49	3,532.38	1,622.25
<b>Pine River Dam:</b>						
Operating .....	1,770.41	1,235.28	1,252.00	1,269.75	1,164.92	930.00
Repairs .....	368.05	188.99				
Crevasse .....	1,329.72					
Total .....	3,468.18	1,424.27	1,252.00	1,269.75	1,164.92	930.00
<b>Sandy Lake Dam:</b>						
Operating .....	2,430.44	1,745.91	1,581.02	1,535.44	1,634.12	1,408.78
Repairs .....	671.92	d999.15			307.27	
Total .....	3,102.36	2,745.06	1,581.02	1,535.44	1,941.39	1,408.78
<b>Superintendence, contingencies, and St. Paul office</b>						
Operating steamboat General Poe .....	3,184.17	1,747.75	3,348.40	3,514.62	3,458.25	2,519.66
Hydrological expenses .....	1,692.22					
Operating expenses applicable to all reservoirs .....	1,109.99	e100.00	e120.00			
Road between Leech Lake and Lake Winnibigoshish .....	1,166.38	2,539.15	1,069.99	2,187.04	1,477.65	1,024.05
	407.01	1,719.16	2,652.96	1,583.77		
<b>Grand total .....</b>	<b>19,487.80</b>	<b>14,100.02</b>	<b>19,350.00</b>	<b>18,498.12</b>	<b>14,500.00</b>	<b>12,302.18</b>

a Repairing dike.

b Repairing dike, \$3,117.70.

c Repairing dike, \$1,078.57.

d Telephone line.

e Gauge readings at Deer River.

For commercial statistics reference must be made to the reports upon the improvement of the Mississippi River.

*Summary of expenditures during the fiscal year ending June 30, 1903.*

Services .....	\$6,876.31
Supplies .....	314.31
Materials .....	1,079.61
Traveling expenses .....	232.15
Office expenses and contingencies .....	2,352.25
<b>Total .....</b>	<b>10,854.63</b>

*Money statement.*

July 1, 1902, balance unexpended .....	\$8,235.07
Amount allotted July 16, 1902 .....	13,300.00
	21,535.07
June 30, 1903, amount expended during fiscal year .....	10,854.63
July 1, 1903, balance unexpended .....	10,680.44
July 1, 1903, outstanding liabilities .....	2,122.62
July 1, 1903, balance available .....	8,557.82

# 1540 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

## ABSTRACT OF TOTAL LIABILITIES INCURRED IN EACH FISCAL YEAR.

During fiscal year ending June 30—		During fiscal year ending June 30—	
1895 .....	\$6,416.19	1902 .....	\$14,500.00
1896 .....	30,800.15	1903 .....	12,302.18
1897 .....	35,180.41	Amount available June 30,	
1898 .....	19,487.80	1903 .....	8,557.82
1899 .....	14,100.02	Total .....	179,192.69
1900 .....	19,350.00		
1901 .....	18,498.12		

## ABSTRACT OF ALLOTMENTS.

January 25, 1895 .....	\$17,590.00	August 15, 1899 .....	\$12,720.02
June 15, 1895 .....	18,852.91	July 16, 1900 .....	20,610.00
June 20, 1896 .....	5,000.00	September 28, 1900 .....	7,000.00
July 24, 1896 .....	23,471.98	August 12, 1901 .....	12,948.12
For repairs to Pine River reservoir .....	7,481.86	July 16, 1902 .....	13,300.00
August 4, 1897 .....	23,870.00	Total .....	179,192.69
August 4, 1898 .....	16,347.80		

## B B 4.

### IMPROVEMENT OF ST. CROIX RIVER, WISCONSIN AND MINNESOTA.

The approved project and report of progress of the work up to June 30, 1902, will be found in the Report of the Chief of Engineers for 1903, Part I, page 400.

During the past fiscal year there has been expended the sum of \$2,390.21.

Owing to the limited amount of funds available, work under the current appropriation was restricted to a thorough overhauling and repair of the working plant. The river channel and the working plant have been deteriorating because of insufficient appropriations, and, as stated in the last annual report, increased appropriations are needed. The economical use of the existing plant in the work of maintenance on the St. Croix River requires an average annual expenditure of \$3,600.

The controversy which commenced in 1897 between the logging and the steamboat interests is still continued. Regulations to govern the use of the river during the season of 1901 were approved by the Secretary of War June 24, 1901, under the act approved May 9, 1900, entitled "An act authorizing the Secretary of War to make regulations governing the running of loose logs, steamboats, and rafts on certain rivers and streams." They have not proven to be satisfactory to the steamboat interests and modified regulations have been under consideration. During the season of 1902 the flow of water in the river was so controlled that the regular operation of steamboats between Taylors Falls and Stillwater, Minn., was not practicable.



*Money statement.*

July 1, 1902, balance unexpended .....	\$2, 617. 69
June 30, 1903, amount expended during fiscal year .....	2, 390. 21
July 1, 1903, balance unexpended .....	227. 48
July 1, 1903, outstanding liabilities .....	42. 00
July 1, 1903, balance available .....	185. 48
Amount (estimated) required annually by existing project .....	<sup>a</sup> 1, 000. 00
Amount that can be profitably expended in fiscal year ending June 30, 1905, for maintenance of improvement, in addition to the balance unexpended July 1, 1903 .....	7, 200. 00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

## ABSTRACT OF APPROPRIATIONS.

By act—		By act—	
Approved June 18, 1878....	\$10, 000	Approved September 19, 1890	\$8, 000
Approved March 3, 1879....	8, 000	Approved July 13, 1892....	8, 000
Approved June 14, 1880....	10, 000	Of August 18, 1894 .....	4, 000
Approved March 3, 1881....	8, 000	Passed June 3, 1896 .....	15, 000
Passed August 2, 1882 .....	30, 000	Approved March 3, 1899....	9, 000
Approved July 5, 1884 .....	9, 000	Approved June 13, 1902....	2, 000
Approved August 5, 1886....	7, 500		
Of August 11, 1888 .....	10, 000	Total .....	138, 500

## REPORT OF MR. R. DAVENPORT, ASSISTANT ENGINEER.

ST. PAUL, MINN., June 30, 1903.

**MAJOR:** The following report on the improvement of the St. Croix River, Wisconsin and Minnesota, for the fiscal year ending June 30, 1903, is respectfully submitted.

Operations connected with this work were confined to the repair of the St. Croix River dredging fleet, in August and September, 1902, at a total cost of \$1,914.03. The work done consisted of the removal from the water and the complete repair and recalking of the hull of dredge *St. Croix*; the repair and rearrangement of the dredge machinery, and the return of the boat to the water. The seven barges, operated in connection with the dredge for supporting conveyor pipes, etc., were also repaired and recalced.

The last work done on the St. Croix River was in 1900, when the dredging fleet was operated on the river between Taylors Falls and Stillwater, in constructing wing and training dams of brush and stone, dredging channels through the bars, and removing obstructions from the channel. It is now reported that to permit steamboat navigation on this section of river at low-water stages some of the bars will again require dredging, and repairs are necessary on many of the brush and stone dams. For safe steamboat navigation it is also reported that the removal of a large number of obstructions from the channel will also be necessary on this section of the river.

Dredging through the bars and repair of the training dams in the vicinity of Hudson, Wis., is reported to be required to permit the movement of boats and rafts through Lake St. Croix at low-water stages.

Other than the running of loose logs, there was but little traffic on the St. Croix River between Taylors Falls and Stillwater during the season of 1902, the control of the water for logging purposes preventing the successful operation of steamboats.

Very respectfully, your obedient servant,

R. DAVENPORT, *Assistant Engineer.*

Major R. L. HOXIE, *Corps of Engineers.*

<sup>a</sup> Project should be modified to make annual expenditure \$3,600.

## B B 5.

## IMPROVEMENT OF MINNESOTA RIVER, MINNESOTA.

The approved project and the report of progress of the work up to June 30, 1902, will be found in the Report of the Chief of Engineers for 1903, Part I, page 401.

There has been expended during the past fiscal year the sum of \$291.56. This trifling expenditure was all that available funds permitted, although the plant is provided from another work. The result, of course, is insignificant.

There is available for the improvement of the St. Croix River a working plant, which is also used in connection with the improvement of the Minnesota River. This consists of a 10-inch centrifugal pump dredge and fleet of boats. The cost of this working plant was about \$7,000. Under the present project an annual expenditure of \$1,000 for maintenance of the St. Croix and of \$500 for maintenance of the Minnesota River is contemplated with the use of this plant. This does not take into account the deterioration of the plant, nor does it provide adequately for the useful improvement of either of these rivers. Both should be retained as navigable streams in actual present use, although not ranking high in the list of navigable rivers. To keep the working plant in good order and employed advantageously upon these two rivers in common will require an annual expenditure of \$5,000, an appropriation of \$10,000 in each biennial river and harbor act. It is proposed to divide the annual expenditure between the two rivers, as follows:

St. Croix River .....	\$3, 600
Minnesota River .....	1, 400

The last river and harbor act contains an appropriation of \$2,500 for the removal of the dam near the mouth of the Minnesota River, such removal being left to the discretion of the Secretary of War. The appropriation has given rise to a controversy between conflicting interests on this river. The dam was put in as the cheaper expedient for improving the lower section of the river, the alternative being dredging over a distance of about 1½ miles. With the working plant in condition, as contemplated, the cost of necessary dredging in lieu of the dam would be about \$5,000, including the removal of the dam. The dam is a source of annoyance to residents on the river banks, who believe it, though without sufficient reason, to be a source of injury to them. Its removal would remove the annoyance. If the present appropriation of \$2,500 were made applicable to the general improvement of the river and a further appropriation of \$2,500 made for the same purpose, all interests would be satisfied. The expenditure of this sum of \$5,000 would occupy the working plant during one season, and thereafter an annual appropriation of \$5,000 for maintenance of this river and the St. Croix River would give profitable employment to the working plant.

During the low-water season of 1902 the Fort Snelling chute was dredged out to a depth of 3 feet at mean low water.

*Money statement.*

July 1, 1902, balance unexpended .....	\$306. 66
June 30, 1903, amount expended during fiscal year .....	291. 56
July 1, 1903, balance unexpended .....	15. 10
(Amount (estimated) required annually by existing project .....	<sup>a</sup> 500. 00
Amount that can be profitably expended in fiscal year ending June 30, 1905, for maintenance of improvement, in addition to the balance unexpended July 1, 1903 .....	5, 000. 00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

## ABSTRACT OF APPROPRIATIONS.

By act—	By act—
Approved March 3, 1867 ... \$37, 500	Approved August 14, 1876.. \$10, 000
Approved July 11, 1870 .... 10, 000	Approved June 18, 1878.... 10, 000
Approved March 3, 1871 .... 10, 000	Of August 11, 1888..... 10, 000
Approved June 10, 1872..... 10, 000	Passed June 3, 1896..... 4, 000
Passed March 3, 1873 ..... 10, 000	Approved March 3, 1899 ... 1, 000
Approved June 23, 1874..... 10, 000	
Approved March 3, 1875 .... 10, 000	Total ..... 132, 500

## COMMERCIAL STATISTICS.

There has been little or no freight traffic on this river during the seasons of 1891-1895, as steamboats could not at all times pass the bar at the mouth of the river. Since 1896 this difficulty has been partially removed, and although the freight traffic has not again developed, excursion steamers from St. Paul, Hastings, Stillwater, and other points have been making irregular trips as far as Shakopee, the head of navigation. The river is a popular resort for these excursion steamers and for a large fleet of steam and naphtha launches. Statistics of passengers carried have not been obtained.

## REPORT OF MR. R. DAVENPORT, ASSISTANT ENGINEER.

ST. PAUL, MINN., June 30, 1903.

MAJOR: The following report on the improvement of the Minnesota River, removing bar at mouth, for the fiscal year ending June 30, 1903, is respectfully submitted. Operations on this work were confined to dredging at the outlet. A channel was cut through the bar for a length of 350 feet, width of 60 feet, and an average depth of 2 feet, making the available depth over the bar about 3 feet at the mean low-water stage. Total excavation, 1,555 cubic yards.

Very respectfully, your obedient servant,

R. DAVENPORT, *Assistant Engineer.*Maj. R. L. HOXIE,  
*Corps of Engineers.*

## B B 6.

## IMPROVEMENT OF RED RIVER OF THE NORTH, MINNESOTA AND NORTH DAKOTA.

The approved project and the report of progress of the work up to June 30, 1902, will be found in the Report of the Chief of Engineers for 1903, Part I, page 401.

<sup>a</sup> Project should be modified to make annual expenditure \$1,400.

## 1544 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

During the past fiscal year there has been expended the sum of \$6,862.15 upon the Red River and its principal tributary, Red Lake River.

The work consisted of dredging in Red River in the vicinity of Grand Forks, N. Dak., and the removal of obstructions from the channel of Red Lake River above Thief River Falls. With the limited appropriations available annually for this work, the plant can not be profitably employed, but is laid up during most of the working season. On Red Lake River little could be done during the past year excepting the care of the plant, which is a fixed charge without any productive return. The cost of the working plant for Red River and Red Lake River was about \$25,000, and the cost of caring for this plant and of repairs on account of deterioration continues without intermission. The work now being done, and requiring to be done annually hereafter, is in fact for maintenance only. The economical use of the working plant, including repairs, requires an annual expenditure of \$7,500, and as appropriations under the river and harbor acts are biennial, the appropriation should be \$15,000.

*Money statement.*

July 1, 1902, balance unexpended .....	\$10,586.40
June 30, 1903, amount expended during fiscal year .....	6,862.15
July 1, 1903, balance unexpended .....	3,724.25
July 1, 1903, outstanding liabilities .....	1,279.75
July 1, 1903, balance available .....	2,444.50
{ Amount (estimated) required for completion of existing project .....	\$6,320.00
{ Amount that can be profitably expended in fiscal year ending June 30, 1905, for maintenance of improvement, in addition to the balance unexpended July 1, 1903 .....	15,000.00
{ Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

## ABSTRACT OF APPROPRIATIONS.

By act—	By act—
Approved August 14, 1876.. \$10,000	Approved September 19, 1890..... 25,000
Approved June 18, 1878.... 30,000	Approved July 13, 1892.... 25,000
Approved March 3, 1879.... 25,000	Of August 18, 1894..... 15,000
Approved June 14, 1880.... 20,000	Passed June 3, 1896..... 20,000
Approved March 3, 1881.... 18,000	Approved March 3, 1899.... 25,000
Passed August 2, 1882..... 10,000	Approved June 13, 1902.... 10,000
Approved July 5, 1884..... 10,000	
Approved August 5, 1886.... 50,000	Total .....
Of August 11, 1888..... 20,000	313,000

## COMMERCIAL STATISTICS.

*Red River of the North, 1902.*—Two steamboats were operated from Grand Forks, N. Dak. Steamer *Grand Forks*, with 5 barges, total tonnage capacity, 684 tons, and steamer *Fram*, with 5 barges, total tonnage capacity, 196 tons. Total freight carried, 20,086 tons.

*Red Lake River, 1902.*—Three steamboats, from 24 to 50 tons burden and 20 to 30 inches draft, were operated on river and lake traffic; and 5 steamboats, from 50 to

<sup>a</sup> Project should be modified to make annual expenditure for maintenance \$7,500.

150 tons burden and 36 to 42 inches draft, were engaged exclusively in lake traffic.  
 Freight handled on river and lake, 500 tons.  
 Passengers carried on river and lake, 948.  
 Logs handled on Red Lake and run down Red Lake River, 82,000,000 feet B. M.

## REPORT OF MR. R. DAVENPORT, ASSISTANT ENGINEER.

ST. PAUL, MINN., June 30, 1903.

MAJOR: The following report of operations in the improvement of the Red River of the North, Minnesota and Dakota, "General Improvement," during the fiscal year ending June 30, 1903, is respectfully submitted.

## SEASON OF 1902.

The work of repairing the dredging fleet for active operations was commenced at Grand Forks, N. Dak., July 22, and was completed August 20. This work consisted of the repair and recalking of the hull of the steamer *Ogama*, the construction of a new boom for dredge *Oter Tail*, and the partial recalking and repainting of the entire fleet of boats, at a total cost of \$925.31.

Dredging operations were commenced August 21 and were continued until October 24, when the fleet was returned to Grand Forks and laid up. The season's work consisted of the removal of stone and other obstructions from the channel of the river at the Northern Pacific Railroad bridge, the dredging of a channel through the landslide at Grand Forks, and six channel cuttings through the bars north of Grand Forks.

Total excavation.....	cubic yards..	17,425
Length of channel cut.....	linear feet..	5,400
Training dams formed with excavated material .....	do.....	5,400
Length of river worked over .....	miles.....	23
Cost of dredging, per cubic yard.....	cents.....	15.9
Cost of subsistence, per ration.....	do.....	37.5

*Dredging in detail.*

No. of cut.	Location.	Excavation.	Channel cut.	Training dams.	Miles worked over.
		<i>Cu. yds.</i>	<i>Linear ft.</i>	<i>Linear ft.</i>	
	Northern Pacific R. R. bridge.....	190			
1	Grand Forks landslide.....	1,125	300	300	
2	Section 16, township 153, range 50.....	4,375	1,600	1,600	12
3	Section 5, township 153, range 50.....	1,850	750	750	4
4	Section 32, township 154, range 50.....	3,150	1,050	1,050	.5
5	Section 20, township 164, range 50.....	800	275	275	5
6	Section 17, township 164, range 50.....	3,635	650	650	1
7	.....do.....	2,400	775	775	.5
	Total .....	17,425	5,400	5,400	23

Steamer *Ogama*, operating with the dredging fleet, towing the fleet, wood barges, etc., made 38 trips. Total miles run, 817; wood loaded and towed to the work, 140½ cords. Steamer *Ogama* operated as a snag boat, worked over 40 miles of river to the north and south of Grand Forks, removing 47 snags (8 to 20 inches diameter), 44 overhanging trees (4 to 12 inches diameter), and 43 bowlders (9 cubic yards of stone). The cost of operating the steamboat is included in the cost of the dredging.

## RED LAKE RIVER, 1902.

Operations on Red Lake River during the season of 1902 consisted of the partial repair of the boats, at a total cost of \$94.88, and the working of the derrick fleet in the removal of obstructions from the channel and banks of the river above Thief River Falls, Minn.

Obstructions removed: Bowlders, 1,773 (260 cubic yards of stone); overhanging trees, 244 (6 to 12 inches diameter); snags, 12 (6 to 18 inches diameter); length of

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river worked over, 11 miles. Total cost of removal of obstructions, \$716.91. Cost of subsistence, per ration, 40 cents. The work was commenced September 10 and closed October 29.

## SEASON OF 1903.

Dredging operations were commenced on the main Red River May 15, and to this date have been continued on the bars north of Grand Forks, from the point at which the work was closed in 1902.

Channel cuttings made .....	5
Total excavation.....	cubic yards 13,400
Length of channel cut.....	linear feet 4,000
Length of river worked over .....	miles 3
Training dams formed with excavated material.....	linear feet 4,000

## Dredging in detail.

Number of cut.	Location.	Excavation.	Channel cut.	Training dams.	Miles worked over.
		<i>Cu. yds.</i>	<i>Linear ft.</i>	<i>Linear ft.</i>	
1.....	Section 18, township 154, range 50.....	1,300	325	325	.....
2.....	do .....	3,250	1,125	1,125	0.5
3.....	do .....	2,975	425	425	.5
4.....	Section 7, township 154, range 50.....	975	425	425	1
5.....	Section 6, township 154, range 50.....	4,900	1,700	1,700	1
	Total .....	13,400	4,000	4,000	3.

Steamer *Ogama*, operating with the dredging fleet, towing the fleet, wood barges, etc., has so far this season made 20 trips; total miles run, 333; wood loaded and towed to the work, 93½ cords.

Steamer *Ogama*, operating as a snag boat, has worked over about 60 miles of river to the north and south of Grand Forks, removing 105 overhanging trees (4 to 21 inches diameter), 36 snags (6 to 12 inches diameter), 19 stumps (8 to 18 inches diameter), and 1 wrecked ferryboat (24 by 16 by 2½ feet), hauled out on the bank in section 2, township 148, range 29.

## RED LAKE RIVER, 1903.

Other than the care of the derrick fleet and property at Thief River Falls, Minn., no work of improvement has been attempted on Red Lake River this year.

The Red River dredging fleet, operating from Grand Forks, N. Dak., at present consists of the following list of boats: Dredge *Otter Tail*, Osgood dipper dredge, hull 75 by 27.5 by 6 feet; steamer *Ogama*, stern-wheel steamboat, hull 100 by 22.9 by 4 feet; 3 wood barges, hull 64 by 16 by 3 feet; 1 slide scow, hull 64 by 16 by 3 feet; 1 quarter boat, hull 45 by 16 by 3 feet; 1 warehouse boat, hull 45 by 16 by 2 feet; 4 skiffs.

With the exception of 2 of the wood barges, the quarter boat, and the warehouse boat, the fleet is in good condition for future work. These last-mentioned boats, with the exception of 1 of the wood barges which has entirely given out, can probably be used for the remainder of this season, but for the continuation of work in 1904 the following repairs will be necessary:

2 wood barges, 64 by 16 by 3 feet, complete repair, \$650 each .....	\$1,300
1 quarter boat, 45 by 16 by 3 feet, new hull.....	450
1 warehouse boat, 45 by 16 by 3 feet, new hull .....	450

Total estimated cost..... 2,200

The Red Lake River derrick fleet, operating from Thief River Falls, Minn., consists of the following boats: 1 derrick boat, hand-power derrick, hull 42 by 18 by 2½ feet; 1 quarter boat, capacity for crew of 16 men, 52 by 12 by 2 feet; 1 flat boat or lighter, hull 24 by 14 by 2½ feet; 1 skiff.

These boats are in fairly serviceable condition, but before work is resumed will require minor repairs, calking and painting, at an estimated cost of \$300.

Very respectfully, your obedient servant,

R. DAVENPORT,  
Assistant Engineer.

Maj. R. L. HOXIE,  
Corps of Engineers.

## B B 7.

IMPROVEMENT OF WARROAD HARBOR AND WARROAD RIVER,  
MINNESOTA.

The approved project and the report of progress of the work up to June 30, 1902, will be found in the Annual Report of the Chief of Engineers for 1903, Part I, page 403.

During the past fiscal year there has been expended the sum of \$4,828.15 in the partial construction of a dredge to be used in the improvement of Warroad Harbor and River. It is expected that this dredge will be completed during the present season and available for work next year. The project for this work is limited to the expenditure of \$48,000, already appropriated, in the construction of a dredge and in two seasons' work thereafter. This project is now under consideration by the Board of Engineers for Rivers and Harbors with a view to such modification as may be desirable.

*Money statement.*

July 1, 1902, balance unexpended .....	\$47, 403. 37
June 30, 1903, amount expended during fiscal year .....	4, 828. 15
July 1, 1903, balance unexpended .....	42, 575. 22
July 1, 1903, outstanding liabilities .....	4, 995. 54
July 1, 1903, balance available .....	37, 579. 68
July 1, 1903, amount covered by uncompleted contracts .....	5, 110. 88

## ABSTRACT OF APPROPRIATIONS.

By act approved March 3, 1899 .....	\$3, 000
By act approved June 13, 1902 .....	45, 000
	48, 000

## ABSTRACT OF CONTRACTS (EMERGENCY) IN FORCE.

Name of contractor.	Date.	Date of beginning.	Date of expiration.
The S. Freeman & Sons Manufacturing Co. ....	Feb. 9, 1903	Feb. 14, 1903	Apr. 30, 1903
National Iron Co. ....	Mar. 6, 1903	Mar. 11, 1903	May 1, 1903
Lake City Engineering Co. ....	Mar. 16, 1903	Mar. 21, 1903	June 15, 1903

## REPORT OF MR. R. DAVENPORT, ASSISTANT ENGINEER.

ST. PAUL, MINN., June 30, 1903.

MAJOR: The following report on the improvement of Warroad Harbor and River, Minnesota, is respectfully submitted.

Operations in connection with this work during the past fiscal year have been mainly confined to the preparation of plans and the purchase of material and machinery for the construction of a self-propelling (stern-wheel) 12-inch centrifugal pump dredge at Warroad, Minn.

\* \* \* \* \*

It was planned to commence the construction of the dredge early in May, this season, and the material and the machinery was ordered with that view, but the failure

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of the contractor to supply the oak lumber, with which it was originally proposed to construct the hull of the boat, and the resulting necessity for the substitution of fir lumber for the main part of the hull, delayed the starting of the construction of the hull of the boat until June, 1903.

The cost of the material and machinery purchased and the work done to this date is as follows:

Lumber for hull and superstructure.....	\$2, 215. 81
Iron work: Castings, bolts, spikes, etc .....	2, 431. 25
Machinery .....	7, 749. 00
Tools and supplies.....	83. 60
Preparation of plans and work to date.....	1, 661. 78
Freight, estimated (on material and machinery delivered or contracted for) .....	2, 500. 00

Total to June 30, 1903.....	16, 641. 44
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The work so far accomplished at Warroad has consisted of the preparation of the boat yard; the construction of the necessary temporary sheds for the protection of the material and machinery; the receipt, delivery at the boat yard, and care of the material and machinery, and the construction of about one-fourth of the frame of the hull of the dredge.

Very respectfully, your obedient servant,

R. DAVENPORT, *Assistant Engineer.*

Maj. R. L. HOXIE, *Corps of Engineers.*

## B B 8.

### SURVEY OF RED LAKE AND RED LAKE RIVER, MINNESOTA.

The approved project and report of progress of the work up to June 30, 1902, will be found in the Report of the Chief of Engineers for 1903, Part I, page 403.

Amount expended to June 30, 1903, \$5,000.

The river and harbor act approved June 13, 1902, provides for the continuation of this survey. The survey has been completed and report will be submitted on or before August 15, 1903.

#### *Money statement.*

July 1, 1902, balance unexpended .....	\$10. 15
June 30, 1903, amount expended during fiscal year .....	10. 15

#### ABSTRACT OF APPROPRIATIONS.

By act approved March 3, 1899.....	\$5, 000. 00
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## B B 9.

### SURVEY OF OTTER TAIL LAKE AND OTTER TAIL RIVER, MINNESOTA.

The approved project and report of progress of the work up to June 30, 1902, will be found in the Report of the Chief of Engineers for 1903, Part I, page 404.

Amount expended to June 30, 1903, \$3,000.

The river and harbor act approved June 13, 1902, provides for the continuation of this survey. The survey has been completed and report will be submitted on or before August 15, 1903.



*Money statement.*

July 1, 1902, balance unexpended .....	\$853. 34
June 30, 1903, amount expended during fiscal year .....	853. 34

## ABSTRACT OF APPROPRIATIONS.

By act approved March 3, 1899.....	\$3,000
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**B B 10.**

## SURVEY OF BIG STONE LAKE AND LAKE TRAVERSE, MINNESOTA AND SOUTH DAKOTA.

The approved project and report of progress of the work to June 30, 1902, will be found in the Report of the Chief of Engineers for 1903, Part I, page 404.

Amount expended to June 30, 1903, \$2,478.84.

The river and harbor act approved June 13, 1902, provides for the continuation of this survey. The survey has been completed and report will be submitted on or before August 15, 1903.

It is proposed to expend the balance of funds available in continuing hydrological observations.

*Money statement.*

July 1, 1902, balance unexpended .....	\$3,130. 69
June 30, 1903, amount expended during fiscal year .....	609. 53
July 1, 1903, balance unexpended .....	2,521. 16
July 1, 1903, outstanding liabilities .....	412. 19
July 1, 1903, balance available .....	2,108. 97

## ABSTRACT OF APPROPRIATION.

By act approved March 3, 1899.....	\$5,000. 00
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**B B 11.**

## GAUGING MISSISSIPPI RIVER AT OR NEAR ST. PAUL, MINNESOTA.

The approved project and report of progress of the work will be found in the Report of the Chief of Engineers for 1903, Part I, page 405.

The allotment of \$500, made August 6, 1902, was expended in the reestablishment of gauges between Lock and Dam No. 2 and the mouth of Minnesota River, and in making daily readings of the same as far as practicable.

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*Money statement.*

August 6, 1902, amount allotted .....	\$500.00
June 30, 1903, amount expended during fiscal year .....	500.00

SUMMARY OF EXPENDITURES DURING FISCAL YEAR ENDING JUNE 30, 1903.

Contingencies .....	\$4.13
Materials .....	40.00
Services .....	455.87
	<hr/> 500.00

ABSTRACT OF ALLOTMENTS.

For fiscal year ending June 30—		For fiscal year ending June 30—	
1889 .....	\$900.00	1898 .....	\$500.00
1890 .....	600.00	1900 .....	500.00
1891 .....	900.00	1903 .....	500.00
1892 .....	900.00		
1893 .....	500.00	Total allotted .....	7,300.00
1894 .....	500.00	Returned to Treasury .....	1,079.94
1895 .....	500.00		
1896 .....	500.00	Total expended .....	6,220.06
1897 .....	500.00		

## APPENDIX C C.

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### IMPROVEMENT OF MISSOURI RIVER, OF OSAGE RIVER, MISSOURI AND KANSAS, AND OF GASCONADE RIVER, MISSOURI.

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*REPORT OF CAPT. H. M. CHITTENDEN, CORPS OF ENGINEERS, OFFICER IN CHARGE, FOR THE FISCAL YEAR ENDING JUNE 30, 1903, WITH OTHER DOCUMENTS RELATING TO THE WORKS.*

#### IMPROVEMENTS.

- |                                      |                               |
|--------------------------------------|-------------------------------|
| 1. Missouri River.                   | 3. Gasconade River, Missouri. |
| 2. Osage River, Missouri and Kansas. |                               |
- 

UNITED STATES ENGINEER OFFICE,  
*Sioux City, Iowa, July 15, 1903.*

GENERAL: I have the honor to submit herewith my annual report upon the improvement of the Missouri River [and Osage and Gasconade rivers] for the fiscal year ending June 30, 1903.

\* \* \* \* \*

H. M. CHITTENDEN,  
*Captain, Corps of Engineers.*

Brig. Gen. G. L. GILLESPIE,  
*Chief of Engineers, U. S. A.*

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## C C 1.

### IMPROVEMENT OF MISSOURI RIVER.

\* \* \* \* \*

A condensed history of the Government work on the Missouri River will be found in the Annual Report of the Chief of Engineers for 1903, page 405.

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## OPERATIONS FOR THE FISCAL YEAR 1902-3.

### LOWER RIVER.

Owing to the small size of the appropriation (act June 13, 1902, \$175,000) work was limited mainly to maintenance and repairs. The following apportionment of the appropriation was made in a project approved by the Chief of Engineers August 1, 1902:

Operating snag boat (two seasons).....	\$20,000
Work at Nebraska City.....	500
Work in vicinity of St. Joseph.....	53,000
Work near mouth of Little Blue.....	4,000
Work at Lexington.....	500
Work at Glasgow.....	7,500
Work at Miami.....	500
Work above Rocheport.....	5,000
Work in first reach.....	40,000
Work at Hermann.....	2,000
Balance unprovided for.....	42,000

At St. Joseph work was carried on during the season of 1902, resulting in the repair of 4,137 feet of revetment in Bon Ton and Elwood bends and the construction of 3,396 feet of new revetment extending from the mouth of Soap Creek to the work put in in 1899.

At Nebraska City the dikes were rescreened during the month of March, 1903.

In the first reach some work was done during the months of March and April for the protection of the Chamois bankhead.

Work was in progress at Little Blue in the month of May, 1903, when the great flood of last spring arrived, suspending all operations and covering the bottom lands with water throughout the entire valley from St. Joseph down. This flood had not subsided sufficiently at the close of the fiscal year to determine the extent of damages resulting from it.

Snagging operations were carried on during the season of 1902 by the steamboat *J. B. McPherson*.

*Transfer of property.*—The vast accumulation of property and records of the late Missouri River Commission during its nineteen years' existence had to be disposed of when the works of the Commission were transferred to this office. The records were sent to Sioux City, together with a part of the office furniture, the balance being transferred to other offices. Of the plant accumulated at the Gasconade boat yard a large portion was sold at auction, March 27, 1903, and other portions have been transferred to various districts under the provisions of the river and harbor act of June 13, 1902. The total amount accruing to the appropriation for the river from these sales and transfers is \$21,605.24.

For detailed information as to the operations of the past year on the lower river, see report of United States Assistant Engineer S. Waters Fox. Mr. Fox separated his connection with the Government service on the 15th of May, 1903, to enter private business. He had been employed under the Engineer Department on the Missouri River for twenty-five years. A great portion of the work on the lower river has been executed under his immediate supervision, and to his efforts are largely due whatever of value these works have contributed to the science of river engineering.

## UPPER RIVER.

By project, approved August 1, 1902, the appropriation for work on the upper river (\$100,000) was allotted as follows to cover two seasons' operations:

For snagging.....	\$16,000
Work at Bismarck, N. Dak .....	4,000
Work at Pierre, S. Dak .....	12,000
Work at Yankton, S. Dak .....	15,000
Work at Elkpoint, S. Dak .....	13,000
Work at Sioux City, both banks .....	20,000
Balance unprovided for.....	20,000

The only operations besides snagging during the season of 1902 consisted in repair work at Pierre, S. Dak., and Sioux City, Iowa, the construction of 1,800 feet of revetment at Elkpoint, S. Dak., and the extension of the revetment above the Combination Bridge, right bank, Sioux City, a distance of 1,982 feet.

Operations are now in progress at Yankton embracing the repair and extension of the dikes at that point.

Snagging was carried on from August to November by the steamboat *Mandan*.

For details of the season's operation, see report of Mr. Bathurst Smith, United States assistant engineer.

## ESTIMATES.

In making future appropriations for the river, the present arbitrary division into the upper and lower districts, with the dividing point at Sioux City, should be abolished and the river be treated as a whole. While the appropriation should be based upon estimates for specific localities, it should itself be in lump sum. The reason for this is that the river and harbor bill generally covers a period of two years, and the expenditures authorized frequently extend to a period of three years from the date of the estimates. In an unstable stream like the Missouri conditions are certain to arise within that period requiring work which could not be foreseen. The appropriation should have sufficient elasticity to permit every emergency to be met as it arises. There could be no possible reason to divert funds from any necessary work included in the estimates, while at the same time it would be possible to meet any ordinary exigency not foreseen when the estimates were prepared.

\* \* \* \* \*

## 1554 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

*Money statement.*

## LOWER RIVER.

July 1, 1902, balance unexpended .....	\$175, 598. 53
Received during the year .....	<sup>a</sup> 21, 635. 99
Total available .....	197, 234. 52
June 30, 1903, amount expended during fiscal year .....	111, 039. 56
July 1, 1903, balance unexpended .....	86, 194. 96
July 1, 1903, outstanding liabilities .....	14, 398. 77
July 1, 1903, balance available .....	71, 796. 19
Amount (estimated) required for completion of existing project .....	Indefinite.

## UPPER RIVER.

July 1, 1902, balance unexpended .....	<sup>b</sup> 106, 716. 51
Total available .....	106, 716. 51
June 30, 1903, amount expended during fiscal year .....	46, 938. 39
July 1, 1903, balance unexpended .....	59, 778. 12
July 1, 1903, outstanding liabilities .....	7, 569. 54
July 1, 1903, balance available .....	52, 208. 58
Amount (estimated) required for completion of existing project .....	Indefinite.

## ENTIRE RIVER.

Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balances unexpended July 1, 1903:	
For works of improvement .....	\$1, 969, 000. 00
For maintenance of improvement .....	722, 500. 00
For snagging and dredging .....	50, 000. 00
	2, 741, 500. 00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of river and harbor act of 1899.	

## APPROPRIATIONS AND ALLOTMENTS, EXCLUSIVE OF THOSE FOR SNAGGING, FOR IMPROVING UPPER MISSOURI RIVER.

Act of—		Act of—	
August 14, 1876 .....	\$20, 000	February 22, 1890 .....	<sup>d</sup> \$300, 000
June 18, 1878 .....	42, 500	July 13, 1892 .....	<sup>e</sup> 150, 000
March 3, 1879 .....	60, 000	August 18, 1894 .....	110, 000
June 14, 1880 .....	43, 000	March 2, 1895 .....	40, 000
March 3, 1881 .....	66, 000	June 3, 1896 .....	235, 000
August 2, 1882 .....	<sup>c</sup> 115, 000	March 3, 1899 .....	205, 000
July 5, 1884 .....	140, 000	June 13, 1902 .....	100, 000
August 5, 1886 .....	60, 000		
August 11, 1888 .....	200, 000	Total .....	1, 886, 500

<sup>a</sup> Received from—	
Osage River appropriation for transfer of materials .....	\$2, 638. 69
Capt. H. M. Chittenden, refunded on account of overpayment .....	30. 75
Transfers of surplus property .....	7, 546. 15
Sale of condemned and surplus property .....	11, 420. 40
	21, 635. 99
<sup>b</sup> Improvement .....	106, 267. 60
Snagging .....	448. 91
	106, 716. 51

<sup>c</sup>\$2,832.42 of this transferred to work below Sioux City.<sup>d</sup>\$192,912 of this afterwards allotted to snagging.<sup>e</sup>\$163.51 of this afterwards allotted to snagging.

# APPENDIX C C—REPORT OF CAPTAIN CHITTENDEN. 1555

In addition to the above amounts about \$60,000 from the appropriations for the survey of the river from Fort Benton to the mouth was spent on the part above Sioux City.

## APPROPRIATIONS FOR IMPROVING UPPER MISSOURI RIVER BY SNAGGING.

<p>Allotments made from appropriations of 1890 and 1892 for improvement of upper Missouri River.....</p> <p>Act of—</p> <p>March 3, 1893.....</p> <p>August 18, 1894.....</p> <p>June 3, 1896.....</p> <p>March 3, 1899.....</p> <p>Total.....</p>	<p>\$193, 073. 53</p> <p>50, 000. 00</p> <p>50, 000. 00</p> <p>50, 000. 00</p> <p>50, 000. 00</p> <p>393, 073. 53</p>
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## APPROPRIATIONS AND ALLOTMENTS FOR IMPROVING MISSOURI RIVER FROM MOUTH TO SIOUX CITY, IOWA.

<p>Act of—</p> <p>July 5, 1884.....</p> <p>August 5, 1886.....</p> <p>August 11, 1888.....</p> <p>February 22, 1890.....</p> <p>September 19, 1890.....</p> <p>July 13, 1892.....</p> <p>March 3, 1893.....</p> <p>August 18, 1894.....</p> <p>March 2, 1895.....</p> <p>June 3, 1896.....</p> <p>June 4, 1897.....</p> <p>July 1, 1898.....</p> <p>January 5, 1899.....</p> <p>March 3, 1899 (river and harbor).....</p> <p>March 3, 1899 (sundry civil).....</p> <p>June 6, 1900 (sundry civil).....</p> <p>June 13, 1902.....</p> <p>Total specific appropriations.....</p> <p>Balance from former appropriations:</p> <p>Act of August 2, 1882, applied to works above Sioux City, Iowa.....</p> <p>Survey of Missouri River from mouth to Fort Benton.....</p> <p>Act of August 5, 1886, applied to removing obstructions from Missouri River.....</p> <p>Total balances.....</p> <p>Refunded on account of overpayments, etc.....</p> <p>Received from Osage River for transfer of materials.....</p> <p>Received from transfers of surplus property.....</p> <p>Received from sale of condemned and surplus property.....</p> <p>Total.....</p>	<p>\$640, 000. 00</p> <p>375, 000. 00</p> <p>1, 000, 000. 00</p> <p>75, 000. 00</p> <p>800, 000. 00</p> <p>600, 000. 00</p> <p>700, 000. 00</p> <p>700, 000. 00</p> <p>710, 000. 00</p> <p>300, 000. 00</p> <p>300, 000. 00</p> <p>300, 000. 00</p> <p>100, 000. 00</p> <p>100, 000. 00</p> <p>200, 000. 00</p> <p>250, 000. 00</p> <p>175, 000. 00</p> <p>\$7, 325, 000. 00</p> <p>4, 000. 00</p> <p>8, 844. 39</p> <p>1, 982. 80</p> <p>14, 827. 19</p> <p>3, 453. 09</p> <p>2, 638. 69</p> <p>7, 546. 15</p> <p>11, 420. 40</p> <p>7, 364, 885. 52</p>
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## COMMERCIAL STATISTICS.

During the calender year 1902 the number of boats engaged in carrying freight and passengers, exclusive of those doing a strictly ferriage business, was 8, with a total tonnage of 620. The freight and passengers carried by them are as follows:

<p>Grain.....</p> <p>Coal and wood.....</p> <p>Lumber.....</p> <p>General merchandise.....</p> <p>Lime and cement.....</p> <p>Miscellaneous.....</p> <p>Live stock.....</p> <p>Total.....</p> <p>Passengers.....</p>	<p>tons.. 14, 226</p> <p>do... 3, 176</p> <p>do... 3, 475</p> <p>do... 8, 523</p> <p>do... 123</p> <p>do... 1, 125</p> <p>do... 423</p> <p>31, 071</p> <p>639</p>
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Commerce of the river, expressed in mile-tons, 2,230,850.

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*Traffic by river reaches.*

Year.	River reaches between—	Freight.	Passen- gers.
		<i>Tons.</i>	
1902.....	Sioux City and Fort Yates.....	9,603	
	Fort Yates and Fort Berthold.....	21,468	221
	Great Falls and Stubbs Ferry.....		418



List of steamers and gasoline boats plying on the Missouri River between Sioux City, Iowa, and Stubbs Ferry, Montana, during the year 1902.

Name.	Where built.	Year built.	Year enrolled.	Tonnage.	Dimensions.			State-rooms.	Berths.	Passengers.	Number.	Engines.		Stroke.
					Length.	Breadth.	Depth.					Inches.	Diameter.	
Washburn.....	Bismarck, N. Dak.	1901	1901	57.48	98	24.8	Port. 3	4	10	37	2	9	9	4
Expansion.....	Expansion, N. Dak.	1899	1899	78.60	123	26	3.5	8	18	48	2	9	9	4
Jim Leighton.....	Pierre, S. Dak.	1895	1895	109	119.8	30	4	.....	2	3	2	12	12	4
Josie L. K.....	Chamberlain, S. Dak.	1884	1886	27	75	16	2.5	.....	.....	.....	2	64	64	1.5
F. Y. Batchelor.....	Pittsburg, Pa.	1883	.....	313	190	30	4.5	7	14	64	2	13	13	5
Imelda.....	Fort Yates, N. Dak.	1892	.....	30	190	17	2	.....	.....	.....	2	5	5	.....
Bismarck.....	Bismarck, N. Dak.	1896	1900	83	120	21	4	1	2	.....	1	.....	.....	.....
Peerless.....	Bismarck, N. Dak.	1897	1897	650	83	21	3.5	.....	4	.....	1	.....	.....	.....
Scotty Phillipa.....	Pierre, S. Dak.	1900	1900	69	106.6	23.8	3.5	.....	2	1	1	13	13	22.5
Annie Austin <sup>a</sup> .....	do.	1898	.....	19	61	15.5	2.5	.....	.....	.....	.....	.....	.....	.....
Vermillion <sup>a</sup> .....	.....	1901	.....	620	51	20.5	2.5	.....	.....	.....	.....	.....	.....	.....
Nellie L. a.....	.....	1900	.....	15	60	13.5	2.2	.....	.....	.....	.....	.....	.....	.....
Cannon Ball <sup>a</sup> .....	.....	1895	.....	620	71	14	3.2	.....	.....	.....	.....	.....	.....	.....
Alace A. a.....	.....	1900	.....	18	61.5	16.5	2.5	.....	.....	.....	.....	.....	.....	.....
Pride of the West <sup>a</sup> .....	.....	1899	.....	16	40.5	22.5	2.5	.....	.....	.....	.....	.....	.....	.....
Little Maud.....	.....	1900	.....	89	105	23	4.5	.....	.....	.....	.....	.....	.....	.....
Myrtles.....	.....	1896	.....	7	82	24	3	.....	.....	.....	.....	.....	.....	.....
Edna.....	Pierre, S. Dak.	1900	.....	22	39	7	2.5	.....	.....	.....	.....	.....	.....	.....
Iowa.....	.....	1900	.....	48	91	18	2.7	.....	.....	.....	.....	.....	.....	.....
Swallow <sup>a</sup> .....	.....	1897	.....	17	48	10.5	4.5	.....	.....	.....	.....	.....	.....	.....
Rose.....	.....	1898	.....	69	44	10	2.9	.....	.....	.....	.....	.....	.....	.....

<sup>a</sup> Gasoline.<sup>b</sup> Estimated.



# APPENDIX C C—REPORT OF CAPTAIN CHITTENDEN. 1559

## COMMERCE OF THE MISSOURI RIVER FROM MOUTH TO SIOUX CITY, IOWA, DURING THE CALENDAR YEAR 1902.

The long-distance trade was done by the St. Louis and Hermann Packet Company, with their steamers *Grapevine* and *Kennedy*, in the trade between St. Louis and Rocheport.

The steamer *St. Joseph* made one trip from Wolfs Point to St. Louis, loaded with wheat. For the balance of the season she was engaged in the excursion business at St. Joseph, Mo.

These steamers and those engaged in the local trade carried 609 passengers during the year.

The following table, giving the amount of freight carried, towed, and rafted, but not including any ferriage, is an approximation to the lower Missouri River's trade for 1902:

TABLE 1

Class.	Grain.	Live stock.	Lumber and wood.	Building material and sand.	General merchandise, farm machinery, etc.	Total.	Mile-tons.
	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>	
Long-trade packets.....	3,930	361	1,172	237	2,289	7,989	1,435,605
Short-trade packets and miscellaneous boats.....	19,332	1,853	5,816	7,403	3,647	38,051	626,925
Sand and wood steamers and barges.....				334,164		334,164	429,492
Rafts.....			12,073			12,073	570,137
Riprap, willows, and lumber, used by private parties for bank protection in the vicinity of Kansas City, Mo.....			5,750	a 12,500		18,250	164,750
Total.....	23,262	2,214	24,811	354,304	5,936	410,527	3,226,909

a Stone, riprap.

The following table gives the totals for the different classes of trade during the last six years, for lower Missouri:

TABLE 2.

Class.	Total tons carried.					
	1902.	1901.	1900.	1899.	1898.	1897.
Long-trade packets.....	7,989	7,806	4,397	715	3,641	4,499
Short-trade packets and miscellaneous boats.....	38,051	87,588	34,787	37,610	39,245	40,476
Sand and wood steamers and barges.....	334,164	463,340	232,395	218,514	252,152	341,710
Rafts.....	12,073	10,935	5,727	6,275	5,755	4,844
Mattress brush, stone, and dike material, for bank protection.....	18,250				19,000	
Total.....	410,527	569,669	277,306	263,114	319,793	391,029

TABLE 3.—Comparative commerce of the lower Missouri River, expressed in mile-tons.

Class.	Mile-tons.					
	1902.	1901.	1900.	1899.	1898.	1897.
Long-trade packets.....	1,435,605	999,116	558,807	98,193	526,304	651,024
Short-trade packets.....	626,925	1,039,767	360,378	410,530	522,872	447,433
Sand and wood steamers and barges.....	429,492	668,783	460,440	422,606	359,948	473,459
Rafts.....	570,137	195,872	103,975	126,432	145,437	164,569
Mattress brush, stone, and dike material, for bank-protection work.....	164,750				375,000	
Total.....	3,226,909	2,903,538	1,483,600	1,057,761	1,929,561	1,736,485

## 1560 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

## REPORT OF UNITED STATES ASSISTANT ENGINEER S. WATERS FOX.

CAPTAIN: I have the honor to submit the following annual report of operations under my charge on the Missouri River, from Sioux City, Iowa, to its mouth, for the part of the current fiscal year ending March 31, 1903.

Operations comprised care and repair of plant, moving plant, revetment construction and repair, dike repair, examinations and surveys, and snagging.

The work was carried on, in accordance with your project of July 20, with funds derived from the following sources:

Appropriation for improving Missouri River from its mouth to Sioux City, Iowa, river and harbor act of June 13, 1902.....	\$175,000.00
Balance left over from previous appropriation.....	94.29
Sale of construction materials to work of construction of Lock and Dam No. 1, Osage River, Missouri.....	2,638.69
Total available funds.....	177,733.98
The total expenditure to March 31 was \$92,256.89.	

## PROJECT.

Your project of July 20, approved by the Chief of Engineers August 1, 1902, provided for the expenditure of \$175,000, as follows:

For operating snag boat during two seasons.....	\$20,000
For work at Nebraska City.....	500
For work in the vicinity of St. Joseph, Mo.....	53,000
For work near mouth of Little Blue River.....	4,000
For work at Lexington, Mo.....	500
For work at Glasgow, Mo.....	7,500
For work at Miami, Mo.....	500
For work above Rocheport, Mo.....	5,000
For work in First Reach.....	40,000
For work at Hermann, Mo.....	2,000
Balance unprovided for.....	42,000
Total.....	175,000

## PLANT.

With the exception of the snag boat *C. R. Suter*, a small lot of furniture, and records in the field offices at Jefferson City and Glasgow, and that in use in the general office of the Missouri River Commission at St. Louis, all of the property of every kind pertaining to the improvement of Missouri River from its mouth to Sioux City, Iowa, was in storage at the United States boat and supply yard, Gasconade, Mo.

All of the floating plant, excepting the snag boat, had been on the storage ways since May, 1901, and some of the hulls for a greater length of time. For want of funds no repairs had been made meanwhile to floating plant, ways, or yard appliances. In fact, plant repair, of a character indicated by the condition of the plant, had been neglected for want of funds so many years that, except for twelve 100-foot barges, built in 1900, the lower Missouri was practically without floating plant with which to commence operations when notification of approval of project was received.

The work of repairing such pieces of floating plant as would be needed during the season on Missouri River work and at Lock and Dam No. 1, Osage River, was commenced July 25, precedence being given to the latter. Owing to an almost unprecedented scarcity of skilled labor and the nondelivery of materials and supplies the repairs were not completed until September 16.

The following pieces were repaired and launched:

For use on Missouri River work: 1 steam tender, *Atalanta*; 2 hydraulic graders, Nos. 7 and 8; 1 office boat, on 64-foot barge; 2 mattress boats; 8 barges, 100 by 25 feet; 1 barge, 64 by 16 feet.

For use on Osage River: 1 pile driver, No. 8, with Nasmyth steam hammer; 2 barges, 100 by 25 feet; 1 barge, 64 by 16 feet.

The cost of this work was \$4,252.58, of which \$308.94 was charged to Osage River appropriation.

The towage of the plant, for Missouri River work, 379 miles upstream to St. Joseph reach, was accomplished between the dates of August 22 and September 30, at a cost of \$3,794.26. In performing this work the hired steamers *Kennedy* and *C. W. Lyon*

and U. S. steam tender *Atalanta* were employed, the first two receiving each \$40 per day and fuel. The *Atalanta* was retained in service on the St. Joseph reach until the 5th of December, when she was laid up for the winter, with the balance of the fleet, in a natural ice harbor near Wathena, Kans. She was placed in commission again March 12 and employed first on the St. Joseph reach. At the close of that month she was engaged in removing plant from St. Joseph to Little Blue reach.

The allotment of \$20,000 to cover the expense of snagging operations on the lower river for two seasons was too small to justify the use, as heretofore, of the snag boat *C. R. Suter*. It was therefore decided to do the work with the snag boat *James B. McPherson*, which could be operated for about one-half the expense of the *Suter*. Between the dates of August 4 and 23 the *McPherson* was repaired and launched at the ice harbor in Big Sioux River, and, after having her boiler and steam connections tested by the United States inspector of boilers, was placed in commission on August 28. The cost of repairs and launching was \$1,714.04.

Current repairs of minor importance were made from time to time by her own crew, excepting the repair of a hole in her bow. The latter, caused by a snag falling on deck, was repaired at a cost of \$106.29. The *McPherson* was laid up in ordinary for the winter in the mouth of Gasconade River on November 29.

The snag boat *C. R. Suter* has not been in commission since October 29, 1900. Since March, 1901, through the courtesy of the engineer officers in charge, she has been lying opposite Chester, Ill., with the inactive fleet of the Mississippi River improvement between the Ohio and Missouri rivers, in the care of two watchmen. The roof of the boat was re-covered during the winter, at an expense of \$577.75.

In compliance with your verbal instructions a force was organized, and, on the 17th of December, began the work of overhauling the boat yard at Gasconade, with a view of selecting and storing, on reduced area, such serviceable articles as can be profitably used in the improvement of the river, and of disposing of the remainder by condemnation and sale, or otherwise, as might be most advantageous to the United States. The estimated field cost of this work is \$9,750, including the cost of rebuilding storage and launching ways that will be adequate for the remaining plant. The latter work March 31, being about 80 per cent toward completion, was still in progress.

On the 9th and 10th of February the unserviceable property at the boat yard was inspected and condemned by Capt. Horace M. Reeve, U. S. Army, acting inspector-general. The condemned property ordered sold by the Inspector-General and numerous other articles authorized to be sold as surplus, being no longer needed for the improvement of Missouri River, were sold at public auction at Gasconade, Mo., on March 27. The gross receipts from the sales were:

From condemned property.....	\$2, 158. 75
From surplus property .....	9, 261. 65

Under date of January 10 I submitted an estimate amounting to \$12,422.60 of the cost of repairing the retained floating plant. On the same day you verbally authorized the work to be done, and measures were at once taken with a view of getting the plant in readiness for next season's operations. None of the lumber for these repairs has yet arrived, and only such repairs have been made as were possible with stock of materials on hand.

#### REVTMENT REPAIR AND EXTENSION, ST. JOSEPH, MO.

\* \* \* \* \*

St. Joseph is situated on the left bank of the river in the bight of the lower one of a series of bends, the general alignment of which is similar to the letter S. A threatened cut-off through the neck of land opposite the city of St. Joseph and later on one through the neck immediately above led to the construction by the General Government, during the period from 1877 to 1889, of over 7.3 miles of bank revetment. This work is about equally divided in length between Bon Ton bend, the upper one of the series, and Belmont and Elwood bends, the latter two being practically one bend.

In the interim (1877 to 1899) the river made extensive encroachments on the left bank in the bend below the city, 600 acres of land having been swept away during that period. The building in that locality of several large packing houses and stock yards, aggregating in value some millions of dollars, has enhanced value of land far beyond that at which they are usually held for agricultural purposes. This has been the real basis of recent appeals by the involved interests for governmental aid. In 1889-1900 protection works were placed there, consisting of 2,659 linear feet of revetment and a longitudinal dike 330 feet in length. The latter extends down-

# 1562 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

stream from near the lower end of the former and has caused accretions to form that mask the bank below it for a considerable distance.

An examination of the improvement works in St. Joseph reach on July 18 and 19 disclosed the following conditions:

*In Bon Ton bend.*—A breach in the revetment 2,500 feet (estimated) in length, in the locality of 5,000 to 7,500 feet below the head of the work; slight indications of a break about 150 feet in length near the lower end of the bend; bare places on the upper bank work in the vicinity of the St. Joseph Water Company's pumping station near the head of the bend; otherwise in good condition.

*Belmont and Elwood bends.*—A breach in the Elwood revetment 600 feet in length (estimated), in the locality of 3,500 to 4,100 feet above the lower end of the work, the shore line deeply indented, and a violent eddy attacking the bank at upper end of the bay; otherwise in good condition throughout.

*Below St. Joseph, Mo.*—Revetment and dike in good condition, the latter apparently affording protection to bank below for a distance of nearly 1 mile; more or less active caving of the left bank from the head of the revetment of 1899 upstream to the mouth of Soap Creek.

It was noted that there was a marked increase in the volume of flow in the chute which follows the right bank below the foot of the Elwood revetment, and there was evidence of recent caving of the main bank there.

The tendency of flow through this chute is to increase the difficulty of passage of river craft through the draw of the Grand Island Railway Company's bridge and to augment the attack against the left bank of the river below the bridge.

The expenditure of the sum of \$53,000, provided for in your approved project, contemplated closing the gaps in the Bon Ton and Elwood revetments, with new revetment, and extending the revetment of 1899 upstream to Soap Creek.

Work was commenced September 23 and carried on, with some interruptions due to weather conditions and delays in receipts of materials, until January 16, when operations were suspended for the season. At that time the only work remaining to be done was a small amount of upper bank pavement, requiring about 230 tons of stone, at the head of the Bon Ton break. This was accomplished between the dates of March 12 and 21, completing the authorized work in St. Joseph reach.

The following is a statement of the work accomplished:

*Bon Ton bend.*—Two thousand five hundred and fifty-eight linear feet of standard revetment, closing gap in old work; 189 linear feet upper bank restored; 490 linear feet of old revetment repaired by fairing out subbank with sink fascines and repairing upper bank where necessary.

*Elwood bend.*—Nine hundred linear feet of revetment restored, of which 757 linear feet entirely rebuilt and 143 linear feet upper bank work only.

*Below St. Joseph.*—Three thousand three hundred and ninety-six linear feet of standard revetment, extending from head of revetment of 1899 to Soap Creek; 536 tons riprap stone stored on bank into piles for emergency use.

The work was performed by hired labor and purchase of material in accordance with law and existing regulations. A portion of the strand and all of the clips used were taken from a supply left over from previous works. The brush was acquired by hired labor.

The cost of these works, aggregating \$50,655.87, is shown in item in the accompanying Exhibits A, B, and C.

## NEBRASKA CITY, NEBB.

Your project provided for the expenditure of the sum of \$500 in making any needed repairs to the five pile dikes on this reach.

An examination on the 5th of March disclosed that, with the exception of dikes Nos. 3 and 5, the structures needed no repairs, and those two required only partial renewals of curtains.

The work was accomplished with a small force, between March 11 and 18, at a cost of \$114.14.

## FIRST REACH, CHAMOIIS, MO.

Your project provides for the expenditure of \$40,000 for the repair, maintenance, and completion of works in first reach.

An inspection on the 22d of March disclosed the bank head near Chamois, Mo., in a damaged condition and seriously threatened by flanking movement from above. Measures were at once taken and work is now in progress looking to the repair and reinforcement of the structure.

## SNAGGING.

The snag boat *James B. McPherson*, leaving Sioux City on August 30, worked her way downstream to near Washington, Mo., by September 24. On this trip special attention was given to reaches of river on which commercial boats ply. In compliance with your instructions a through run was then made to Kansas City, Mo., the boat arriving there on October 2.

From October 4 to 7 the boat was utilized in inspecting the river from Kansas City to the mouth, yourself, Col. Amos Stickney, Corps of Engineers (Division Engineer), and the writer being on board. The inspecting party left the boat at St. Louis, and the latter, after taking on supplies, was cleared for Missouri River the 9th of October, with instructions to work her way upstream from the mouth to Kansas City, Mo. On the 20th of October, while working under these orders, near the mouth of Grand River, a snag fell on deck, causing damage that made it necessary to take the boat to Kansas City for repair.

Leaving Kansas City November 5, she worked her way downstream to Hermann, Mo., by the 17th of that month, and then returning to the Gasconade River was laid up in ordinary for the winter just below the Missouri Pacific Railway Company's bridge.

The following work was accomplished during the season.

Number of snags removed, 193; number of snags abandoned, 3; number of piles<sup>a</sup> pulled, 66; number of trees felled, 270; number of miles run downstream, 1,466; number of miles run upstream, 769.

The expense of operating the snag boat from the time she was put in commission until laid up for the winter was:

Labor .....	\$4,088.44
Fuel .....	1,227.95
Subsistence .....	916.80
Supplies, lines, etc .....	788.84
Traveling expenses .....	148.69

Total cost of operating two and one-half months..... 7,170.72

The snag boat was again placed in commission on the 14th of March, the intention being to make an early working tour from the mouth of the river to Boonville, Mo., with a view to clearing the way for commercial boats.

Owing to a sudden rise the stage of river was too high at that time for snagging, and you authorized the use of the boat for an inspection, by myself and Assistant Engineer Bathurst Smith, of the river from Kansas City to the mouth.

The inspection trip was made between March 20 and 23.

The snag boat worked her way upstream from the mouth to Gasconade by March 27, pulling 11 snags en route. At the close of the month, the river being still too high for snagging, she was engaged on construction work near Chamois.

## INSPECTION OF WORKS, EXAMINATIONS AND SURVEYS, AND SPECIAL REPORTS.

*Kansas City, Mo., to mouth of river.*—All works below Kansas City were inspected twice during the year, October 4 to 7 and March 20 to 23.

*Dakota City, Nebr.*—In compliance with your instructions an examination of the river in the vicinity of Dakota City was made on the 30th of July. A report on the situation, with a project and estimate of cost of work deemed necessary to protect the town front, was prepared and submitted the same day.

*Plattsmouth, Nebr.*—A special examination and partial survey were made at this point October 21, with a view of getting some information concerning a ponton bridge recently built there.

*Nebraska City, Nebr.*—An examination of the works on this reach was made March 5.

*Rulo, Nebr.*—Advice having been received that the revetment in Rush Bottom bend, above Rulo, Nebr., was threatened by a flanking movement from above, an examination of that work was made February 11. The report proved to be without foundation. The revetment was found to be intact throughout the bend, and its upper end protected by shore-bar growth of much more extensive area than formerly.

*St. Joseph, Mo.*—A special examination of the St. Joseph reach, as called for in section 1 of the river and harbor act of June 13, 1902, was made July 18 and 19.

Partial shore-line surveys in the reach were made in September and November,

<sup>a</sup>Taken from the wreckage of bank head 1 D, above Rocheport, Mo.

# 1564 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

the former showing the location and extent of breaks in the revetments, the latter showing the extent of bank erosion opposite St. Joseph.

*At and near mouth of Kaw River.*—A special examination of Kaw River, as called for in section 14 of the river and harbor act of June 13, 1902, was made February 8.

In addition to the inspections above referred to, special inspections or examinations and surveys were made at points below Kansas City, as follows.

*Little Blue reach.*—An examination and partial survey of this reach was made August 22.

*Lexington, Mo.*—An examination of the river in the vicinity of Lexington, Mo., on March 20, was made the subject of a special report to you, dated April 4.

*Bakers bend, opposite Carrollton, Mo.*—An application by private individuals for authority to build dikes for the protection of land in Bakers bend was investigated, and an examination of the river in the locality of the proposed structure was made July 29. The matter was made the subject of a special report, dated August 1.

*Miami, Mo.*—An examination and partial survey of this reach was made October 23.

*Glasgow Reach.*—An examination of this reach on the 21st of March was made the subject of a special report dated April 4.

*Above Rocheport, Mo.*—A special examination and survey of Diana Bend, in the vicinity of old bank head 1 D, was made August 20 and 21, and a report accompanied by a map of the survey was submitted under date of August 30.

*At Hermann, Mo.*—A hydrographic survey of Hermann Harbor and its approaches was made September 23 to October 2, and a chart prepared.

*Howard Bend, above St. Charles, Mo.*—An examination and partial survey of the reach was made October 22.

Very respectfully, your obedient servant,

S. WATERS FOX,  
Assistant Engineer.

Capt. H. M. CHITTENDEN, *Corps of Engineers.*

## EXHIBIT A.

*Elements of work and cost in item of repairs to revetment in Bon Ton bend, August, 1902, March, 1903.*

Classification and extent.	Cost in item.	Total cost.
Grading bank, 2,747 linear feet:		
Labor .....	\$653.67	
Board and traveling expenses .....	166.89	
Supplies .....	4.87	\$725.43
Construction and anchorage of 2,683 linear feet mattress:		
1,387.94 cords brush .....	1,901.47	
21,612 pounds $\frac{1}{4}$ -inch strand .....	1,192.98	
1,758 cable clips .....	157.38	
Labor .....	1,961.66	
Board and traveling expenses .....	71.45	5,274.94
Ballasting mattress, 2,558 linear feet, and paving upper bank, 2,747 linear feet:		
7,307.05 tons stone .....	6,843.71	
Labor .....	5,070.94	
Board and traveling expenses .....	50.26	11,964.91
Light repairs of 490 linear feet of revetment lower down: Labor .....		149.81
Towboat service, superintendence, and all other items of expense, excepting general office and plant items .....		2,324.77
Total cost of repairs in Bon Ton bend .....		20,439.86

NOTE.—Materials on hand from previous appropriation to amount of \$1,192.98 shown in this exhibit.



## EXHIBIT B.

*Elements of work and cost in item of repairs to revetment in Elwood bend, October and December, 1902.*

Classification and extent.	Cost in item.	Total cost.
Grading 900 linear feet bank:		
Labor .....	\$144. 25	
Board and traveling expenses .....	55. 62	
Supplies .....	2. 64	
		\$202. 51
Construction and anchorage of 757 linear feet mattress:		
380 cords brush .....	520. 60	
7,203 pounds $\frac{1}{4}$ -inch strand .....	397. 61	
586 cable clips .....	52. 46	
Labor .....	457. 83	
Board and traveling expenses .....	19. 42	
		1, 447. 92
Ballasting mattress, 757 linear feet, and paving 900 linear feet upper bank:		
2,201.25 tons stone .....	2,033. 96	
Labor .....	1,165. 41	
Board and traveling expenses .....	14. 36	
		3,213. 73
Towboat service, superintendence, and all other items of expense, excepting general office and plant item .....		684. 33
Total cost of repairs in Elwood bend .....		5,548. 49

NOTE.—Materials on hand from previous appropriations to amount of \$397.61 shown in this exhibit.

## EXHIBIT C.

*Elements of work and cost in item of building 3,396 linear feet of standard revetment in the bend below St. Joseph, Mo., from mouth of Soap Creek to a junction with the revetment built in the fall of 1899.*

Classification and extent.	Cost in item.	Total cost.
Grading 3,396 linear feet bank:		
Labor .....	\$753. 37	
Board and traveling expenses .....	210. 12	
Supplies .....	6. 46	
		\$969. 95
Construction and anchorage of 3,421 linear feet mattress:		
1,696 cords brush .....	2,326. 26	
28,814 pounds $\frac{1}{4}$ -inch strand .....	1,493. 92	
2,344 cable clips .....	209. 84	
Labor .....	2,248. 49	
Board and traveling expenses .....	90. 65	
		6,369. 16
Ballasting mattress and paving upper bank, 3,396 linear feet:		
8,760.05 tons stone .....	8,976. 29	
Reserve stone stored on bank for emergency use:		
151 tons on sections 2 and 3.		
385 tons on sections 16 to 20.		
536 tons stone .....	709. 66	
Labor .....	4,527. 82	
Board and traveling expenses .....	78. 93	
		14,286. 70
Towboat service, superintendence and all other items of expense, excepting general office and plant items .....		3,051. 71
Total cost of revetment extension below St. Joseph .....		24,677. 52

NOTE.—Materials on hand from previous appropriations to amount of \$1,110.07 are shown in this exhibit.

1566 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

REPORT OF MR. BATHURST SMITH, ASSISTANT ENGINEER.

SIOUX CITY, IOWA, June 30, 1903.

CAPTAIN: I have the honor to submit the following report of operations on the upper Missouri River during the fiscal year ending June 30, 1903.

*Bismarck Harbor.*—The amount allotted from the appropriation of June 13, 1902, for work at this point was \$4,000, only repair work being contemplated.

The only work done was the rebracing and rescreening of the group of right bank dikes near Mandan. This work was done in March, 1903, at a cost of \$715.40.

*Pierre and Fort Pierre.*—The amount allotted from the appropriation of June 13, 1902, for work at this point was \$12,000.

Extensive repairs were made to the works at this point. The north end of Marion Island Dam was raised and strengthened, about 700 feet of the revetment at the head of Marion Island, which had been undermined by the strong current at this point, was rebuilt and the revetment was extended 205 feet downstream; extensive repairs were made to the revetment at the center of Marion Island, and minor repairs were made to the dikes on both sides of the river. Rock was also hauled in place for repairing the revetment below Bad River. In addition to the reconstruction of a portion of the revetment at the head of Marion Island, it has been decided to strengthen the revetment at the most exposed point with a dike constructed close to and parallel with the bank. This work was begun, but was not finished at the close of the fiscal year.

The cost of the 205 feet of new revetment constructed was \$1,321.50, and the cost of repairs to old work was \$7,766.40.

The scarcity of labor at this point and the constant changing of the force employed, due to the high wages paid on ranches, added greatly to the cost of this work.

*Yankton.*—The amount allotted from the appropriation of June 13, 1902, for work at this point was \$15,000.

It has been decided to expend this allotment in extending the right-bank group of dikes begun in 1897, with the view of forcing the river over to the Yankton side and restoring the steamboat landing at that place. The floating plant for this work has been calked and materials ordered, but no construction work has been done. Two hundred and forty-seven of the oak piles stored at Yankton were rafted down for use in this work.

*Elkpoint.*—The amount allotted from the appropriation of June 13, 1902, for work at this point was \$13,000.

It was decided to expend this allotment in filling in with standard revetment the gap of 1,800 feet between the pieces of revetment constructed in 1899 and 1900. This work was completed in September to December, 1902, making 7,364 feet of continuous revetment at this place.

The stone for the work was purchased at Dell Rapids, S. Dak., being brought to Elkpoint on cars and hauled to the river bank, a distance of 3 miles, by teams. The brush was obtained mostly by hired labor, a portion being obtained by contract. Six hundred and fifteen tons of rock were left on the bank to be used in case of emergency. The scarcity of labor at this place increased the cost of the work.

A detailed statement of the cost of the fieldwork is given in Exhibit A attached to this report.

*Sioux City.*—The amount allotted from the appropriation of June 13, 1902, for work on both banks at this point was \$20,000.

On the Nebraska side a revetment 1,982 feet in length was constructed from the lower end of the work completed in 1900 to the upper end of the longitudinal dike constructed by the bridge company. Between this point and the bridge the bank is holding well and seems to be in no danger of cutting.

The bank revetted had previously been protected by a woven-brush mattress extending from the top of the bank into the river 100 feet outside of the low-water line, constructed by the railroad company in 1890. No rock was used in this work by the railroad company except a sufficient quantity to sink the mattress, the woven mattress being depended on to prevent the erosion of the bank above low water.

When the bank was examined to determine the character of the work required it was found that the mattress above the low-water line had rotted and had disappeared, but below the low-water line it seemed for the most part to be in good condition as far as could be ascertained. It was decided to slope and pave the bank above low water as in standard revetment and to connect the work above water with the old work under water with a woven mattress 45 feet in width. This work was done in September to December, 1902.

The stone for the work was obtained at Dell Rapids, S. Dak., being brought to Sioux City on cars and hauled to the site of the work with teams. The brush was obtained by contract.

A detailed statement of the cost of the fieldwork is given in Exhibit B attached to this report.

On the Iowa side the only work done was the reconstruction of the lower 350 feet of the revetment constructed in 1900 on the Sioux City front and the extension of this revetment downstream for a distance of 50 feet in order to utilize construction material on hand.

The cost of the fieldwork was \$1,357.90.

In addition to the stone used in the work, 950 tons were purchased and distributed along the bank, to be used in case of emergency.

*Snagging.*—The amount allotted from the appropriation of June 13, 1902, for snagging operations, to cover two seasons, was \$16,000.

It was decided to use only one snag boat, the *Mandan*, instead of two as hitherto, the *James B. McPherson* being transferred to the lower river.

The *Mandan* was placed in commission on August 11 and was engaged in snagging over the portions of the river between Sioux City and about 100 miles above Bismarck, N. Dak., covered by commercial boats, until November 17, on which date she was laid up for the winter at Rockhaven ice harbor.

The work done by the boat during the season was as follows: Snags removed, 261; trees felled, 86; miscellaneous obstructions removed, 22; miles run, up, 976; miles run, down, 359.

Repairs on the boat have been begun, and she will be placed in commission for the coming season's work as soon as the water reaches the proper stage.

*Miscellaneous work.*—During August, 1902, repairs were made to the floating plant at the Sioux ice harbor for use on the various works on the lower portion of the upper river, and the snag boat *James B. McPherson* was repaired and launched for use on the lower river.

In April an examination was made at Benton, Mont., to determine the advisability of work at that point, and in June a similar examination was made at Mannheim, N. Dak.

No gauges were maintained on the upper river during the fiscal year.

Since April 1 the works on the upper river have been in charge of United States Assistant Engineer E. D. Vincent, I having been engaged since that date on work on the lower Missouri River.

Very respectfully, your obedient servant,

BATHURST SMITH,  
U. S. Assistant Engineer.

Capt. H. M. CHITTENDEN, *Corps of Engineers.*

#### EXHIBIT A.

*Net cost of fieldwork of 1,800 feet of revetment constructed at Elkpoint, S. Dak., during fiscal year ending June 30, 1903.*

	Quantities.	Cost per unit.	Cost of each item.	Total.
<b>Grading and clearing:</b>				
Grading and clearing bank.....feet..	1,800	\$0.592	.....	\$1,065.85
<b>Weaving and anchoring mattresses:</b>				
Brush, cutting and hauling.....cords..	685	1.486	\$1,018.09	.....
Brush, loaded on barge.....do.....	164	1.67	273.88	.....
Brush, towing.....do.....	849	.481	408.77	.....
Brush, total cost.....do.....	849	2.003	1,700.74	.....
Wire strand, three-eighths-inch.....feet..	45,000	.011 +	519.28	.....
Clips.....number.....	1,100	.033	36.30	.....
Labor, weaving and anchoring.....square feet..	181,740	.006	1,063.26	.....
Total cost mattresses.....do.....	181,740	.025	.....	3,309.58
<b>Ballasting mattresses and paving bank:</b>				
Stone, on cars at quarry.....tons.....	4,237.8	.29	1,228.96	.....
Stone, freight on, Del Rapids to Elkpoint.....do.....	4,237.8	.48	2,034.15	.....
Stone, hauling and distributing on bank.....do.....	4,237.8	.34	1,440.85	.....
Stone, total cost on bank.....do.....	4,237.8	1.11	4,703.96	.....
Stone, cost labor placing on work.....do.....	4,237.8	.202	856.19	.....
Total cost ballasting and paving.....do.....	4,237.8	1.312	.....	5,560.15
Towing plant, Sioux City to Elkpoint and return.....do.....	.....	.....	.....	170.85
Superintendence.....do.....	.....	.....	.....	629.50
<b>Total cost fieldwork, revetment.....feet..</b>	<b>1,800</b>	<b>5.964</b>	<b>.....</b>	<b>10,735.93</b>

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## EXHIBIT B.

*Net cost of field work of 1,982 feet of revetment constructed on Nebraska side at Sioux City, Iowa, during fiscal year ending June 30, 1903.*

	Quantities.	Cost per unit.	Cost of each item.	Total.
Grading:				
Grading and clearing bank.....feet..	1,982	\$0.398		\$788.50
Weaving and anchoring mattress:				
Brush, delivered on works.....cords..	201.9	1.98	\$399.76	
Brush, loaded on barge.....do.....	353.6	1.67	590.51	
Brush, towing.....do.....	353.6	.454	160.67	
Brush, total cost.....do.....	655.5	2.072	1,350.94	
Wire strand, three-eighths inch.....feet..	27,000	.011+	311.07	
Clips.....number..	700	.033	23.10	
Labor, weaving and anchoring.....square feet..	93,600	.006	566.71	
Total cost mattress.....do.....	93,600	.022		2,041.82
Ballasting mattress and paving bank:				
Stone on cars at quarry.....tons..	3,690.7	.29	1,070.30	
Stone, freight on, Dell Rapids to Sioux City.....do.....	3,690.7	.48	1,771.54	
Stone, hauling and distributing on bank.....do.....	3,690.7	.33	1,217.93	
Stone, toll over bridge.....do.....	3,690.7	.10	369.07	
Stone, total cost on bank.....do.....	3,690.7	1.20	4,428.84	
Stone coat, labor placing on work.....do.....	3,690.7	.197	728.07	
Total cost ballasting and paving.....do.....	3,690.7	1.397		5,156.91
Towing plant.....				70.85
Superintendence.....				458.75
Total cost field work revetment.....feet..	1,982	4.297		8,516.88

## C C 2.

## IMPROVEMENT OF OSAGE RIVER, MISSOURI AND KANSAS.

\* \* \* \* \*

The amount expended by the General Government under both projects up to June 30, 1903, is \$365,526.23; amount expended during the past year is \$18,417.99.

The act of June 13, 1902, appropriated \$30,000 for continuing improvement of the river and for maintenance, "of which amount so much thereof as may be necessary shall be used for the completion of Lock and Dam Numbered One."

Under date of July 26, 1902, the Chief of Engineers approved a project for the expenditure of this sum of money. As it seemed probable that the completion of the lock and dam would take the entire sum no provision was made for general improvement until it would be determined whether there would be any balance.

An examination of the work on the subsidence of high water made it evident that the funds available would be totally inadequate for completing the lock, and accordingly only such work was done during the past season as would not be liable to suffer deterioration during the time which must elapse before a new appropriation can be made. The report of Assistant Engineer Blaisdell herewith gives the details of the work done.

By authority of the Chief of Engineers, dated May 12, 1903, an additional estimate for completing Lock and Dam No. 1 is presented herewith, together with the reasons therefor.

It was expected that the work on the lock and dam would be completed during the season of 1900. Work to that end was progressing satisfactorily when a sudden and unusual rise in the river swept out the cofferdam, arrested the work in progress, and did a large amount of damage. Before the damage could be repaired another freshet

occurred with even more disastrous results than the first. Both of these rises were entirely unusual and unprecedented for the season of the year. The result was that the completion of the lock with the funds available became impossible.

Under date of November 9, 1900, Captain Keller submitted a report to the Chief of Engineers concerning the conditions then existing upon the work of completion of the lock and dam. In this report, which was printed as Senate Document No. 109, Fifty-sixth Congress, second session,<sup>a</sup> Captain Keller estimated as the amount required to be appropriated and necessary for completion of the lock and dam on November 1, 1900, the sum of \$20,000.

The above estimate was made on the supposition that a river and harbor bill would pass at the ensuing session of Congress, but this expectation was not realized. Since that time the Missouri River Commission has increased the estimate only by an amount necessary to cover the increased cost of caring for the plant and property.

The effect of two seasons high water and the general deterioration of the plant had gone so far, as already stated, that it was found impossible last season to finish the work without another appropriation. The great flood of the past spring has caused much additional damage. The grounds were entirely flooded, the cement for the concrete destroyed, the sand and gravel much injured by silt deposit, some lumber and material lost, and other damage done to the plant and material. What additional scour there may have been through the uncompleted portion of the dam can not yet be determined, but it was sufficiently great last fall to alter entirely the problem of closing this gap from what it was in the year 1900. It will be necessary to construct a cofferdam in nearly 20 feet of water and hold it against the entire current of the river. The work can not now be done before the summer of 1904, or four years after Captain Keller's estimate.

Below is given a detailed estimate of the amount required to complete this work.

*Estimate for completion, Lock and Dam No. 1, Osage River.*

Cofferdam (material wanted in addition to that on hand):

31 round piles, 45 feet long, long-leafed pine at 30 cents per linear foot .....	\$418. 50
110 direct braces 16 feet by 3 by 8 inches, 3,520 feet B. M., at \$30 ..	105. 60
16 filling blocks, pieces 16 feet by 8 by 12 inches, 2,048 feet B. M., at \$30 .....	61. 40
138 linear feet triple-lap sheet piling, 30 feet by 10 inches and 12 by 2½ inches, 37,260 feet B. M., at \$40 .....	1,490. 40
Delivery of latter .....	15. 00
Making 243 triple lap-sheet piles (45 of new lumber, 78 of lumber on hand) .....	243. 00
Bolts and spikes .....	30. 00
Labor on round piles and bracing, 324 feet, at \$3 .....	972. 00
Labor on driving sheet piles (168 feet on lower arm), 324 feet (156 feet on upper arm), at \$8 .....	2,592. 00
Struts and braces, inside of coffer, labor and material .....	400. 00
For additional height of 4 feet around cofferdam, about 10,000 feet B. M., at \$70, placed .....	700. 00
Talus of earth on outside of coffer—say, 2½ yards per linear foot, 1,790 cubic yards, at 50 cents .....	895. 00
Filling upper arm of old coffer with earth, new part, 400 cubic yards, at 50 cents .....	200. 00

<sup>a</sup>See Appendix C C of the Annual Report of the Chief of Engineers for 1901, p. 2369.

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## Cofferdam, etc.—Continued.

Filling upper arm of old coffer with earth, old part, 135 cubic yards, at 50 cents .....	\$67. 50
Filling lower arm of old coffer with earth, old part, 400 cubic yards, at 50 cents .....	200. 00
Repairs to barges and plant, erecting cable way, etc., preparatory to another season's work, approximately .....	1, 009. 60
	<hr/> 9, 400. 00

## Pumping, four months:

3 engine men, 3 firemen, including subsistence, \$390.....	\$1, 560. 00
Installing pump, boiler, and engine .....	300. 00
Piping, repairs, delivery of coal and supplies.....	340. 00
	<hr/> 2, 200. 00
	11, 600. 00

NOTE.—This estimate contemplates the free use of additional floating plant and hoisting machinery to be borrowed for temporary use from Missouri River or other works.

Tripple lap-sheet piling under toe of dam, 245 feet less 18 feet constructed = 227 linear feet required, to be constructed of piles already made up, as follows:

133 old piles, rebuilt, 20 feet by 9½ = 108 linear feet.	
102 piles of "1902" construction, 22 feet by 10½ = 87 linear feet.	
40 piles of "1902" construction, 30 feet by 9½ = 32 linear feet.	
Handling and driving 275 piles, at \$7 each .....	1, 925. 00
Round piles under apron of dam, oak:	
214 piles, 30 feet long = 6,420 linear feet, to be purchased, 30 cents .....	\$1, 926. 00
Driving 6,420 linear feet piles, inside of coffer, 30 cents .....	1, 926. 00
	<hr/> 3, 852. 00

## Lumber:

Caps and stringer on piles under dam and piers, 10 by 10 inches, Y. P.; stringers on apron, 10 by 10 inches, Y. P. Piles are driven irregularly and filling and splicing will be necessary.	
23,000 feet B. M. Y. P. lumber on hand, placing at \$45 under dam.....	1, 035. 00
Frames under apron, Y.P.:	
Wanted 28 pieces 10 feet by 10 by 5 inches, 1,170 feet B. M., at \$30..	35. 00
Laying 25,000 feet B. M. of 4 by 8 inch, 5 by 10 inch, and 10 by 10 inch, at \$45 .....	1, 125. 00
Floor and apron plank, oak:	
3-inch plank—material on hand.....	17, 800 feet B. M.
6 by 8-inch plank, apron, part of material on hand .....	33, 200 feet B. M.
Laying.....	51, 000 feet B. M., at \$35 ..
328 pieces 10 feet by 6 by 8 inches to be purchased 13,120 feet B. M., at \$40 .....	525, 00

## Earth of rock filling:

Under plank grillage, 227 by 25 feet by 3.8 .....	792 cubic yards
Under apron, 245 feet by 16½ by 6.8.....	1, 018 cubic yards
Above sheet piling at toe of dam, about.....	390 cubic yards
	<hr/> 2, 200 cubic yards, at 70 cents
Filling behind lock wall, 4,000 cubic yards, at 50 cents.....	2, 000. 00

	25, 422. 00
Setting 177 units of iron frames, at \$5.....	885. 00
Forming for 2 piers and 3 dam sections .....	600. 00
Concrete 960 cubic yards, at \$3, material on hand .....	2, 880. 00
Setting pipes, controlling valves, etc.....	500. 00
Power house:	
Concrete foundation under switch stand .....	\$150. 00
Tank, boiler, and pump connection; oil, etc.....	350. 00
	<hr/> 500. 00
Raising weirs by hand and cleaning interior of weirs and piers .....	1, 500. 00

APPENDIX C C—REPORT OF CAPTAIN CHITTENDEN. 1571

Power house—Continued.

Dredging below lock and clearing lock; repairs to broken machinery, etc.....	\$1,500.00
Clearing ground, storing plant, and lumber:	
Cleaning and piling lumber.....	\$350.00
Building warehouse.....	800.00
Painting, etc.....	150.00
Storing plant.....	300.00
	<hr/>
Fuel for general use—350 tons, at \$3.....	1,600.00
General expense:	1,050.00
Supervision and care of plant from July 1, 1903, to July 1, 1904:	
6 months at \$350 per month.....	\$2,100.00
6 months at \$750 per month.....	4,500.00
	<hr/>
	6,600.00
	<hr/>
Supplemental work:	43,037.00
Doubling plank on upper surface of weirs, 15,000 feet B. M. oak, placed.....	900.00
Working barge for repairs, etc.....	800.00
Railroad tracks from warehouse to gates and steamboat landing.....	500.00
Filling and paving at head of lock on land side.....	750.00
Pile pier head at head of lock.....	1,500.00
Construction and material for coffer in lock chamber.....	300.00
New power house.....	400.00
Concrete sidewalks, say.....	163.00
	<hr/>
Total.....	48,350.00

The foregoing estimate was prepared by Assistant Engineer Blaisdell from data on hand at the close of the working season of 1902. The damage caused by the flood of 1903, which include the cement, sand, and gravel for the concrete, an immense deposit of mud over all the works, the undermining of some of the plant, and the loss of some floating material will materially raise this figure. The amount can only be approximately estimated, but will aggregate, for the foregoing items, not less than \$10,000, making the total itemized estimate \$58,350. To this should be added an unusually large item for contingencies owing to the indeterminate character of the work of closing off the gap in the dam. It is believed that this item should be not less than 20 per cent. Adding this percentage to the above amount gives \$69,900—say \$70,000. The balance now on hand will be used to pay for care of plant until the next appropriation is available, and whatever amount is left will be needed on the general improvement of the river. The full amount of \$70,000 will have to be appropriated if the work is to be completed.

*Money statement.*

July 1, 1902, balance unexpended.....	\$35,924.07
June 30, 1903, amount expended during fiscal year.....	18,417.99
	<hr/>
July 1, 1903, balance unexpended.....	17,506.08
July 1, 1903, outstanding liabilities.....	245.22
	<hr/>
July 1, 1903, balance available.....	17,260.86
	<hr/>
Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903:	
For works of improvement.....	\$63,000.00
For maintenance of improvement.....	7,000.00
	<hr/>
	70,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

# 1572 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

## APPROPRIATIONS AND ALLOTMENTS.

Act of—

August 18, 1894 .....	\$46,000.00
June 3, 1896 .....	50,000.00
March 3, 1899 .....	25,000.00
June 6, 1900 .....	146,000.00
June 13, 1902 .....	30,000.00
Balances transferred January 15, 1895, from Maj. Charles J. Allen, Corps of Engineers:	
Act of September 19, 1890 .....	42,655.18
Act of July 13, 1892 .....	43,366.44
Refunded on account of overpayment .....	10.69
<b>Total .....</b>	<b>383,032.31</b>

## COMMERCIAL STATISTICS.

The steamboat traffic was performed principally by the steamers *Osage*, *Parker*, *J. R. Wells*, and *Peerless*, carrying 389 passengers.

TABLE 1.—Close approximation to the amount of river trade during 1902.

Class.	Grain.	Live stock.	Lumber and wood.	Railroad ties.	Building material and gravel.	Barytes.	Salt.	Produce.	General merchandise, farm machinery, etc.	Total.	Miletons.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	
Packets.....	6,000	153	1,050	730	2,921	3	304	397	1,583	13,141	675,706
Rafts, etc....			185	72,420	9,448					82,063	3,334,066
<b>Total ..</b>	<b>6,000</b>	<b>153</b>	<b>1,235</b>	<b>73,150</b>	<b>12,369</b>	<b>3</b>	<b>304</b>	<b>397</b>	<b>1,583</b>	<b>95,194</b>	<b>4,009,770</b>

TABLE 2.—Comparative statement of the commerce of the river from 1902 to 1895.

Shipments.	1902.	1901.	1900.	1899.	1898.	1897.	1896.	1895.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Grain, hay, etc.....	6,000	4,232	8,722	4,077	3,418	1,598	2,651	4,426
Live stock .....	153	1,058	934	873	1,038	909	843	1,366
Lumber, logs, wood, railroad ties....	74,385	56,221	76,583	57,663	74,881	66,175	62,764	64,986
Gravel and sand .....	12,369	8,000	7,500	9,945	3,015	1,350	4,500	3,600
Salt .....	304	218	256	371	348	229	416	328
Produce.....	397	141	91	165	201	256	188	191
General merchandise, farm machinery, etc.....	1,583	2,379	1,988	3,608	1,385	731	1,031	1,739
Barytes .....	3	90	70					
<b>Total.....</b>	<b>95,194</b>	<b>72,339</b>	<b>96,144</b>	<b>76,702</b>	<b>84,296</b>	<b>71,247</b>	<b>72,398</b>	<b>76,706</b>

TABLE 3.—Comparative commerce of the river expressed in mile-tons.

Class.	1902.	1901.	1900.	1899.	1898.	1897.	1896.	1895.
Packets and miscellaneous boats .....	675,705	277,106	545,107	393,136	349,965	178,695	212,398	263,554
Rafts, etc .....	3,334,065	2,425,710	3,060,215	2,968,121	3,825,099	8,707,200	3,839,483	2,941,500
<b>Total.....</b>	<b>4,009,770</b>	<b>2,702,816</b>	<b>3,605,322</b>	<b>3,361,257</b>	<b>4,175,054</b>	<b>8,885,895</b>	<b>4,051,881</b>	<b>3,205,053</b>

REPORT OF MR. A. H. BLAISDELL, ASSISTANT ENGINEER.

UNITED STATES ENGINEER OFFICE,  
Sioux City, Iowa, June 30, 1903.

CAPTAIN: I have the honor to submit the following report on the operations carried on under your direction at Lock and Dam No. 1, Osage River, during the working season of 1902,



The season was characterized by phenomenal high stages of water, as is evidenced by inspection of the accompanying hydrograph.

Experience in former years appears to have demonstrated that economical or even safe cofferdam work is not possible when the stage is much above 110 feet, or about 5 feet above ordinary low water.

During the past season the number of working days in each month, when the stage was below 110 feet, was as follows: July, none; August, 14; September, 7; October, 10; November, an aggregate of 15; December, an aggregate of 11. During such short and widely separated intervals but little actual construction work could be accomplished. It might be said that the frequency of the rises was fortunate in respect that it was not possible to more than commence exposed work, as it surely would have been destroyed by the high water had it been partly in place.

No work, excepting care of property, had been done on the lock and dam during the fiscal year ending June 30, 1902.

During the working season of 1900 a light cofferdam had been built, inclosing the three sections of fixed dam and movable weir and two piers, which remained to complete the permanent work; but the coffer had been washed out by two unexpected rises while in process of building, and the river bed had been scoured out on the line of the dam to a depth of from 6 to 14 feet below its original bed (see Report of the Chief of Engineers, United States Army, 1901, Supplement), and the work was necessarily suspended.

At the beginning of the season of 1902 there remained, in a very unstable condition, about one-half of the cofferdam of 1900, and the adopted project was to reinforce this old work and to close by a new coffer the remaining half of the open gap in the dam and to proceed with the building of the permanent-dam sections and the piers. The new cofferwork was to be built to an elevation of 114 feet, or 4 feet above that of the old.

A commencement only was made in carrying out this project, as it became evident by October 1 that the high water had already curtailed the working season to such an extent that none of the project could be carried to a successful completion, except the reinforcement of the old coffer work, the general renovation of the yard appliances, which had become much deteriorated and even unsafe by usage and decay, the careful assortment and repiling of the lumber on hand, which had been culled over in building the completed work, and much of which was in a decayed condition, and the purchase of lumber and the building and proper storage of additional tripple lap-sheet piling for use during the next working season.

The year being so far advanced, the purchase of special material could not be undertaken without much greater delay, the piling lumber, the bracing, and common sheet piling for the reinforcement work were obtained from an excess on hand at Gasconade boat yard, which had originally been purchased by the Missouri River Commission, and although it answered the purpose, much of it was not so well adapted as lumber especially ordered for the work would have been.

The yellow-pine piling was deficient in strength through age, and the 4 by 8 inch common sheet piles required splicing in many cases for necessary lengths and required a longer time to place them than would obtain with greater widths.

An aggregate of 52 round piles and 461 linear feet of sheet piles were driven in this reinforce work: the round piles were given a penetration of not less than 18 and the sheet piles of from 5 to 11 feet.

The sheet piles were driven with a Vulcan pile hammer, used as a drop hammer and rigged with a triangular extension framework, worked from a barge, except in cases of inaccessibility, where a log drop hammer, worked by hand from the old cofferdam, was used.

High water permitted the filling with earth of only the lower arm of the reinforce work, in which about 750 cubic yards of material dredged from the fore-shore bar at the foot of the lock chamber was deposited, and subsequently covered with plank to prevent wash.

A A-shaped sheer dike of single piles, spaced about 12 feet apart and used also for mooring purposes, was built about 100 feet above the reinforcement work to ward off drift wood and to induce a deposit over the scoured-out area, for both of which objects it appeared to be effective.

Tripple-lap sheet piles, as follows, were built and stored under thorough cover: One hundred and seventy-one piles of new lumber, 28 to 34 feet long by 9½ and 11½ inches wide; 102 piles of new lumber, 23 to 24 feet long by 9½ and 11½ inches wide; 133 piles, rebuilt from old unserviceable ones, 20 feet long by 9½ and 10 inches wide.

The old lumber piled in the yard received a thorough overhauling and was properly repiled, of which it stood in much need, many pieces being found partially decayed and otherwise defective.

# 1574 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

The weir lumber, which had been salted and placed under partial cover and which has been reported as sufficient in quantity, was not disturbed, but a considerable portion of it was warped and twisted, and it is possible some of it may be found unfitted for use.

Roofs, foundations, and derricks were renewed where necessary. The floating plant is not in good condition, but most of it is serviceable if repairs are not delayed too long.

A measurement of sand and gravel, made October, 1902, showed their respective amounts to be 1,020 cubic yards and 1,480 cubic yards, which is somewhat in excess of what will be required.

An estimate in detail for completing the lock and dam is herewith submitted, and was prepared previous to the high water of June, 1903.

This flood reached the extraordinary height of 132.5 feet, which means a depth of 6 feet and more over the bank where the lumber was piled and where the storage buildings are located.

The estimate submitted makes no provision for any loss which may have occurred during this high water.

\* \* \* \* \*

For greater detail reference may be made to large scale drawings on file in your office.

Very respectfully, your obedient servant,

A. H. BLAISDELL,  
Assistant Engineer.

Capt. H. M. CHITTENDEN,  
Corps of Engineers.

C C 3.

## IMPROVEMENT OF GASCONADE RIVER, MISSOURI.

\* \* \* \* \*

The act of June 13, 1902, appropriated the sum of \$10,000 for the Gasconade River. A project for its expenditure, approved by the Chief of Engineers July 26, 1902, provided for two seasons' work, to consist of removal of snags and other obstructions, the building of wing dams, and doing such other work as would yield immediate benefit to the channel.

During the past season operations have been carried on at Bock's bar, Stake shoal, Woodpecker Island, Hensleys shoal, and Pryors Island. The boating channel was cleared of snags and wreck heaps and all overhanging trees were trimmed or felled. Attention is invited to the accompanying report of Mr. Fox upon the operations of the past season.

The work on this river is undoubtedly of a good deal of benefit to navigation, and should be provided for in the future as it has been in the past.

### Money statement.

July 1, 1902, balance unexpended .....	\$10,259.54
June 30, 1903, amount expended during fiscal year .....	3,831.94
July 1, 1903, balance unexpended .....	6,427.60
July 1, 1903, outstanding liabilities .....	1.54
July 1, 1903, balance available .....	6,426.06
Amount (estimated) required for completion of existing project .....	Indefinite.
Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903:	
For works of improvement .....	\$27,000.00
For maintenance of improvement .....	3,000.00
	30,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

# APPENDIX C C—REPORT OF CAPTAIN CHITTENDEN. 1575

## APPROPRIATIONS AND ALLOTMENTS.

Act of—		Act of—	
June 14, 1880 .....	\$5,000	July 13, 1892 .....	\$4,000
March 3, 1881 .....	10,000	August 18, 1894 .....	5,000
August 2, 1882 .....	10,000	June 3, 1896 .....	5,000
July 5, 1884 .....	5,000	March 3, 1899 .....	15,000
August 5, 1886 .....	7,500	June 13, 1902 .....	10,000
August 11, 1888 .....	5,000		
September 19, 1890 .....	4,000	Total .....	85,500

## COMMERCIAL STATISTICS.

The steamboat traffic was principally carried on by the steamers *Peerless*, *Henry Wohlt*, and *Mill Boy*, carrying 101 passengers.

TABLE 1.—Close approximation to the amount of river trade during 1902.

Class.	Grain.	Live stock.	Lumber and wood.	Railroad ties.	Building material.	Produce.	General merchandise, farm machinery, etc.	Total.	Mile-tons.
Packets .....	Tons. 4,446	Tons. 167	Tons. 456	Tons. 27,714	Tons. 9,845	Tons. 130	Tons. 1,487	Tons. 16,531	1,231,183
Rafts .....			135					27,849	2,508,270
Total .....	4,446	167	591	27,714	9,845	130	1,487	44,380	3,739,453

TABLE 2.—Comparative statement of the commerce of the river trade 1902 to 1895.

Shipments.	1902.	1901.	1900.	1899.	1898.	1897.	1896.	1895.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Grain, hay, etc .....	4,446	2,437	4,796	2,100	1,667	1,467	3,197	3,203
Live stock .....	167	485	255	414	706	696	1,131	920
Lumber, logs, wood, railroad ties .....	28,305	14,899	15,504	19,864	27,134	27,614	40,350	42,436
Building material, gravel, sand .....	9,845	418	166	6	320	69	493	
Salt .....	68	20	44	33	57	85	96	83
Produce .....	130	97	82	85	223	114	131	122
General merchandise, farm machinery, etc .....	1,419	1,134	733	1,757	872	490	806	780
Total .....	44,380	19,460	21,580	24,259	30,961	30,515	46,294	47,544

TABLE 3.—Comparative commerce of the river, expressed in mile-tons during the eight years 1902 to 1895.

Class.	1902.	1901.	1900.	1899.	1898.	1897.	1896.	1895.
Packets and miscellaneous boats .....	1,231,183	869,223	236,962	307,376	162,594	179,777	229,215	197,574
Rafts .....	2,508,270	1,347,300	1,187,290	1,079,753	1,669,669	2,080,125	8,293,080	3,247,507
Total .....	3,739,453	1,616,523	1,424,272	1,387,129	1,832,263	2,259,902	3,522,275	3,445,081

## REPORT OF MR. S. WATERS FOX, ASSISTANT ENGINEER.

UNITED STATES ENGINEER OFFICE,  
Sioux City, Iowa, April 4, 1903.

CAPTAIN: I have the honor to submit the following report of operations on Gasconade River for the portion of the current fiscal year ending March 31, 1903:

The project for the improvement of this stream, adopted in 1880, contemplated

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the removal of snags and logs from the channel and of leaning trees from the banks of the river where necessary and the construction of wing dams and training walls to concentrate the flow of water upon the shoals to increase the depth there.

Your project of July 20, 1902, approved by the Chief of Engineers under date of July 26, 1902, provides for the expenditure of the current appropriation of \$10,000 in the same way to cover two seasons' work. The precise localities to be improved were not specified, the stage of river at the time being too high to ascertain condition of channel and old improvement works.

The middle of September was passed before an examination of the river could be made, and the season being so far advanced it was decided to confine the operations during the fall to the lower 31 miles of river, from Pryor's mill to the mouth.

Mr. C. C. Wrenshall was placed in personal charge of the field work and instructed to repair and reenforce existing works at Bock's bar, Stake shoal, Woodpecker Island, Brown's shanty, Hensley's shoal, and Pryors Island; snags and wreck heaps were to be removed from the boating channel and overhanging trees trimmed or cut down. The total field expenditures for the season were to be kept within \$3,500.

Field work was actively commenced September 24 and continued until December 12, when it became necessary to suspend operations for the season on account of severe weather and a high stage of river.

This season was a very unfavorable one. Frequent rains and sharp rises in the river interfered greatly with the work. The repairs at Bock's bar and Stake shoals were not completed and nothing was done at Brown's shanty. The authorized work at Woodpecker Island, Hensley's shoal, and Pryors Island were completed. The boating channel was cleared of snags and wreck heaps and all overhanging trees were trimmed or felled. The total expense incurred to March 31 was \$3,572.40. The work was done by hired labor and purchase of material in accordance with law and existing regulations.

For details of the work accomplished at each point and the general effect upon the channel of the river and its commerce I beg leave to refer to the accompanying report of Overseer C. C. Wrenshall.

Very respectfully, your obedient servant,

S. WATERS FOX,  
*Assistant Engineer.*

Capt. H. M. CHITTENDEN,  
*Corps of Engineers.*

REPORT OF MR. W. C. WRENSHALL, UNITED STATES OVERSEER.

SIR: I have the honor to submit the following report of operations on Gasconade River, Missouri, during the period from September 1 to December 31, 1902:

The plant and property belonging to Gasconade River were turned over to me September 6, and by September 24 had been assembled in the mouth of Gasconade River, the hulls put in good repair and outfitted with lines, small tools, etc., necessary for the season's work. An inspection of the lower 39 miles of the river was made on steamer *Henry Wohlt*, between September 15 and 18, and a report thereon submitted to you under date of September 19. Your instructions covering the work to be done were received by me September 23.

These instructions provided for the repair and reenforcement of existing works at Bock's bar, Stake shoal, Woodpecker Island, Brown's shanty, Hensley's shoal, and Pryors Island. Snags and wreck heaps were to be removed from the boating channel, and overhanging trees trimmed or cut down. The total field expenditures were not to exceed \$3,500.

BOCK'S BAR.

The authorized work at this point was the closing of a breach in the cross dike near its junction with the training wall.

Field work commenced September 24, the working fleet of three-decked barges being taken to Bock's bar in tow of the hired steamer *Henry Wohlt*. A small force began the same day to open a stone quarry and cut crib timbers.

On the morning of September 24 Gasconade River was at an average low water stage, but during the ensuing five days raised 6.9 feet, and on this account the work here was not completed. As a temporary expedient the main dike was connected with the training wall by a dam built in the shoal water above the breach. In this work 87 cubic yards of stone were used in training wall. A total of 159 cubic yards stone was quarried at this point and a total of 193 pieces of timber cut. Of the latter a portion was corded on fleet for upriver points and the balance was

stored on bank for future use at this point. All snags and fallen timber were removed from the chute.

#### PRYOR'S MILL.

The authorized work at this point was the repair and reenforcement of the existing bank revetment. On a portion of the work the bank had receded back of the anchor piles to such an extent that they were in the best boating water and constituted a menace to river craft. These were to be pulled out and others cut off to proper elevation. The bank back of the piles was to be made safe against further erosion.

The fleet reached Priors Island, the highest working point, on October 14, and the authorized work was commenced at once. The 18 piling in the channel were pulled out and 68 others cut to low elevation. The heads of the latter were strongly interlaced with heavy wire up and down stream, and anchored with wires to substantial stakes on shore. A grillage mattress of willows, 280 feet in length and about 2 feet thick, was laid in behind the anchor piles, and well covered up with riprap stone. There were expended in this work 89 cords willow brush, 192 cubic yards stone, and 80 pounds wire and spikes. All snags and fallen timber lying in the chute were removed and the overhanging timber cut and dropped inshore. The standard inclined gauge at this point was repaired, and the reference bench marks transferred to a large tree about 50 feet back from the bank.

Between October 27 and 29 the fleet was dropped from Pryors to Hensleys, a distance of about 9 miles. The channel in this reach was cleared of snags and wreck heaps, and overhanging trees were felled.

In all, 15 snags and 3 wreck heaps were removed and 16 trees cut down.

#### HENSLEY'S SHOAL.

The authorized work here was the closing of a breach in the training wall of the old dike and building up the structures to their original grade lines. The breach in the training dam was 55 feet long on bottom line and 80 feet on top of crib line, with about 30 inches of water pouring through the gap at, say, 8 miles per hour. A pothole about 9 feet in depth and 30 feet diameter had developed in and below the breach. A breakwater, composed of stakes strongly wired and willow fascines, was constructed across the contained angle between the dam and training wall. The old dam was cleared of all driftwood, and the gap was closed with cribwork of substantially the same construction as the old. The stream bed above and below new cribs was well protected with heavy riprap stone.

The condition of main and training dams was quite poor, being degraded from original elevation as much as 20 per cent of original height, and in some portions the main dam was so much damaged as to permit the free passage of water. After repair to main breach was affected, the general repair was taken up and the entire top line of dam and training was brought to its original elevation.

The heaviest work and the most expensive was clearing the chute from its collection of fallen timber. Nine large trees, three stumps, and three wreck heaps were removed. The following materials were expended in repair work: 72.86 cubic yards rock; 37 cubic yards gravel; 832 linear feet round timber; 8 cords willow brush; 230 pounds spikes, wire, and three-eighths-inch strand.

On completion of the repairs the passage of water was again confined to the boating chute, with an average depth of 4 feet of very swift water. Noting this fact and apprehending a continuance of bank erosion, all growing timber adjacent to bank edge was felled. The work was brought to completion on November 8.

On the 9th of November the fleet was made up and on 10th was dropped out for floating to Woodpecker Island work, with a stop at Catfish shoals dam. In the stretch of 11 miles between Hensley's and Woodpecker Island dams there were removed from the boating channel 20 large submerged snags, 11 fallen trees, and 3 wreck heaps. The conditions at Catfish shoals were such that it was thought best not to close at present the breach in the dam.

#### WOODPECKER ISLAND.

The work authorized at this point consisted in repairing the old dike and building an auxiliary dike.

Arriving with the fleet and party on the 14th of November, I found the main dam to be 800 feet in length, of which 300 feet crossing the old main waterway was in very poor condition, being degraded to such an extent as to permit about

# 1578 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

45 per cent of the low-water discharge to pass down the old channel, thus leaving only 55 per cent of the discharge in the boating channel.

In repairing the old dam 552 linear feet of round timber, 18.50 cubic yards of riprap stone, and an estimated quantity of spawls were used. This relieved the situation in the old channel to such an extent that the construction of the auxiliary dam below the old one was readily accomplished. The new dam is 175 feet in length. In its construction there were expended 1,364 linear feet of round timber, 91 cubic yards of riprap stone, 140 pounds of spikes, and an estimated amount of 24 cubic yards of quarry strippings. The work was completed November 26.

## STAKE SHOAL.

The work at this point was to consist of repairs to the old dam and some light dredging in the channel immediately above the structure.

Arriving here with the fleet and party November 28, work was at once commenced and was still in progress on December 12, when weather conditions became so severe and the stage of the river so high that you directed a suspension of operations for the season.

The following work was accomplished: Main dam rebuilt to original grade and extended 25 linear feet to new shore connection; bank protected at new shore end of dike. There were expended in this work 720 linear feet of round timber and 66 cubic yards of riprap stone.

In pursuance of your instructions there was properly piled at Stake Shoals work, on land owned by Mr. Fritz Steinke, 86 pieces round timber and an estimated amount of 40 cubic yards of riprap stone, and at Bock's bar, on land owned by Mr. John Englert, 78 pieces round timber and an estimated amount of 87 cubic yards of riprap stone, the latter in three piles.

The fleet was towed to Gasconade by the steamer *Henry Wohlt* on the 15th and then dismantled, all property being stored in the United States boat yard.

The expenditures for the season were as follows:

For labor .....	\$1,781.63
For towage .....	229.25
For construction materials .....	71.75
For stones and supplies .....	668.84
For traveling expenses .....	101.97
For superintendence .....	637.86
<b>Total .....</b>	<b>3,491.29</b>

The general results of the season's work may be best considered when viewed from the standpoint that during the period of observation—September 15 to December 15, inclusive—the steamers plying the river made 36 successful trips without hindrance or accident, making a total mileage of over 1,100 miles and bringing out of the river during the boating season over 55,000 sacks wheat, 4,000 sacks flour, 800 head of hogs and cattle, and 1,600 packages of butter, eggs, etc., besides quantities of other small items. These results and the fact that during the same time rafts containing 32,000 ties passed down would seem to indicate a fairly permanent boating depth of water on shoals and a satisfactory freedom from obstructions.

Very respectfully,

C. C. WRENSHALL,  
U. S. Overseer.

Mr. S. WATERS FOX,  
U. S. Assistant Engineer, Sioux City, Iowa.

## APPENDIX D D.

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### IMPROVEMENT OF CUMBERLAND RIVER, TENNESSEE AND KENTUCKY, AND OF OBION AND FORKED DEER RIVERS, TENNESSEE.

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*REPORT FOR THE FISCAL YEAR ENDING JUNE 30, 1903, WITH OTHER DOCUMENTS RELATING TO THE WORKS. OFFICERS IN CHARGE, LIEUT. COL. M. B. ADAMS AND CAPT. W. J. BARDEN, CORPS OF ENGINEERS.*

#### IMPROVEMENTS.

- |  |  |
|--|--|
| 1. Obion and Forked Deer Rivers, Tennessee.                              | 3. Removing sunken vessels or craft obstructing or endangering navigation. |
| 2. Cumberland River, Tennessee and Kentucky, below Nashville, Tennessee. |  |
- 

ENGINEER OFFICE, UNITED STATES ARMY,  
*Nashville, Tenn., July 10, 1903.*

GENERAL: I have the honor to transmit herewith the annual report \* \* \* upon the river improvements in my charge relating to the Nashville, Tenn., district for the fiscal year ending June 30, 1903.

Very respectfully, your obedient servant,

W. J. BARDEN,  
*Captain, Corps of Engineers.*

Brig. Gen. G. L. GILLESPIE,  
*Chief of Engineers, U. S. A.*

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#### D D 1.

### IMPROVEMENT OF OBION AND FORKED DEER RIVERS, TENNESSEE.

A detailed description of the Obion River, plans for improvement, previous project, and modifications of same, are given in the Annual Report of the Chief of Engineers for 1896, page 1897 et seq., and same

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report for 1897, page 2217 et seq., and of the Forked Deer River, page 1900 et seq., id.

No work was done on these streams during the fiscal year. The total expenditures for the year ending June 30, 1903, amounting to \$261.33, were on account of watching and caring for engineer property. The balance available will be used for maintenance of channels.

A snagging party will be sent out as soon as practicable during the coming fiscal year.

## Money statement.

July 1, 1902, balance unexpended .....	\$4, 712. 70
June 30, 1903, amount expended during fiscal year .....	261. 33
July 1, 1903, balance unexpended .....	4, 451. 37
July 1, 1903, outstanding liabilities .....	24. 50
July 1, 1903, balance available .....	4, 426. 87
<hr/>	
{ Amount that can be profitably expended in fiscal year ending June 30, 1905, for maintenance of improvement, in addition to the balance unexpended July 1, 1903 .....	
{ Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899. ....	
	4, 500. 00

## APPROPRIATIONS.

### Obion River, Tennessee.

By act of—	
July 13, 1892 .....	\$7, 500
August 18, 1894 .....	7, 500
June 3, 1896 .....	6, 000
March 3, 1899 (for maintenance) .....	2, 500
Total .....	23, 500

### Forked Deer River, Tennessee, and its navigable branches.

By act of—	
August 2, 1882, for South Fork .....	\$3, 000
July 5, 1884, for South Fork .....	2, 000
August 5, 1886, for South Fork .....	5, 000
August 11, 1888, for South Fork .....	2, 500
August 11, 1888, for North Fork .....	4, 500
August 11, 1888, for main river .....	2, 500
September 19, 1890, for North Fork and main river .....	2, 500
July 13, 1892, for Forked Deer River (completing improvement) .....	3, 000
Total to complete project .....	25, 000
June 3, 1896, for Forked Deer River (for maintenance) .....	1, 000
June 3, 1896, for North Fork or Middle Fork from Dyersburg to Mississippi River .....	5, 000
March 3, 1899, for Forked Deer River (for maintenance) .....	2, 000
Total .....	33, 000

### Obion and Forked Deer rivers, Tennessee.

By act of June 13, 1902 (for maintenance) .....	\$4, 500
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# APPENDIX D D—REPORT OF CAPTAIN BARDEN. 1581

## COMMERCIAL STATISTICS.

*Obion and Forked Deer rivers, Tennessee, from January 1 to December 31, 1902.*

	Tons.
Logs .....	67,128
Lumber .....	31,111
Staves .....	1,750
Wood .....	16,000
Telegraph poles .....	200
Live stock .....	443
Flour .....	72
Hay .....	100
Grain .....	35
General merchandise .....	576
<b>Total tonnage .....</b>	<b>117,415</b>
<b>Estimated value .....</b>	<b>\$611,303</b>
<b>Passengers carried .....</b>	<b>1,370</b>

*List of steamboats (stern-wheel) plying upon Obion and Forked Deer rivers, Tennessee.*

[Calendar year 1902.]

Name.	Registered dimensions.			Net tonnage.
	Length.	Breadth.	Depth.	
	<i>Feet.</i>	<i>Feet.</i>	<i>Feet.</i>	
Vernie Mac .....	127	24.7	4.9	122
J. M. Linder .....	100	18	4	73
L. H. Buhrman .....	112.6	23.2	4.9	80
A. R. Hall .....	72	15	11.5	39
Beaver .....	169.5	30.6	5.1	314
Iona a .....				
Sarah a .....				
J. W. Lewis .....	84	10	2.5	8

a Gasoline; dimensions not given.

## D D 2.

### IMPROVEMENT OF CUMBERLAND RIVER, TENNESSEE AND KENTUCKY.

(a) BELOW NASHVILLE, TENN.

For description of this stream, character of its obstructions, and efforts for its improvement made from 1830 until the adoption of the present project; also for statement of certain examinations and surveys made from 1870 to 1880, see the following reports of the Chief of Engineers: 1871, page 474 et seq.; 1896, page 1905 et seq.; 1899, page 2238 et seq.

During the fiscal year ending June 30, 1903, \$31,839.93 was expended, of which \$1,405.67 was applied to snagging, the balance to Lock A and

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contingencies. The following is a detailed statement of the work done at lock and abutment of Dam A:

At the lock—	Cubic yards.
Riprapping bank .....	3,937
Filling behind land wall .....	4,035
Excavation .....	3,430
Cofferdam removed .....	3,685
Stone broken for paving .....	823
Stone broken for dam .....	6,000
Stone delivered from quarry .....	826
Paving set back of land wall .....	821.8
Riprap back of paving .....	712
Masonry, retaining wall .....	325
Concrete .....	110
Abutment side—	
Earth excavated .....	3,900
Gravel excavated .....	650
Stone boated .....	620
Filling behind walls, upstream end .....	580
Filling behind walls, downstream end .....	1,480
Masonry laid .....	820

Miscellaneous work included the building of two barges, converting hull of steamer *Susette* into barge, dismantling dredge boat, repairs to steamer *Cumberland*, and certain changes to buildings and tracks required for the passage of the Tennessee Central Railroad through the United States reservation.

By authority of the Secretary of War that company was allowed to purchase from the United States 1.07 acres of land for a right of way for the sum of \$800, \$100 for the land and \$700 for changes to buildings and tracks. The money has been received and deposited to the credit of the appropriation and the deed executed, but not yet delivered, pending the compliance by the company with certain conditions named therein.

Contracts were entered into with the Featherstone Foundry and Machine Company, of Chicago, Ill., December 15, 1902, for construction of a dredge, at \$18,650, and with Ed. J. Howard, of Jeffersonville, Ind., January 26, 1903, for 2 steam tenders, 2 dump scows, 6 decked barges, and 2 derrick-boat hulls, aggregating \$28,268. This plant will be used in the upper and lower Cumberland River and will be paid for equally from appropriations for both sections. Under these contracts delivery was to have been made May 1, 1903, but the time limit has been waived and delivery has not yet been made.

Proposals for construction and erection of 4 pairs of steel lock gates, operating mechanism and filling valves, for Lock A on the lower and Lock No. 1 on the upper Cumberland, were twice solicited under thirty-day newspaper advertisements, dated January 28, 1903, and March 18, 1903, it being intended to make one contract for both locks. Under the first advertisement no bids were received. Under the second only one was received, viz, from the Penn Bridge Company, of Beaver Falls, Pa., which aggregated \$60,800, \$33,900 for Lock A and \$26,900 for Lock 1, and provided for delivery and erection only by September 30, 1904. This was rejected as being excessive, and directions were received to prepare new designs both for timber and metal gates, with a view to securing alternate proposals, and erecting timber gates if no reasonable bids for steel gates are received. These designs will be shortly completed and the work readvertised.

The snag boat *Apex* began work October 1, 1902, and stopped No-

ember 30 on account of high water. One hundred and fifty miles of river were cleared, the following obstructions having been removed:

Snags removed .....	380
Snags cut .....	394
Leaning trees cut .....	1,540
Logs cut .....	90
Trees deadened .....	18

The balance available will be used for the completion of Lock and Dam A, and for maintenance. The estimate submitted below of the amount that can be profitably expended in the fiscal year ending June 30, 1905, should be applied to the location and acquisition of the sites of locks and abutments of Dams B, C, and D, and to the commencement of construction of the same.

*Money statement.*

July 1, 1902, balance unexpended .....	\$180,455.17
Proceeds of sale of land, Lock A .....	800.00
	<hr/>
June 30, 1903, amount expended during fiscal year .....	181,255.17
	<hr/>
July 1, 1903, balance unexpended .....	31,839.93
July 1, 1903, outstanding liabilities .....	149,415.24
	<hr/>
July 1, 1903, balance available .....	24,395.88
	<hr/>
July 1, 1903, balance available .....	125,019.36
July 1, 1903, amount covered by uncompleted contracts .....	23,459.00
	<hr/>
(Amount (estimated) required for completion of existing project .....	1,534,500.00
Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903:	
For works of improvement .....	\$395,000.00
For maintenance of improvement .....	5,000.00
	<hr/>
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	400,000.00

APPROPRIATIONS.

*Improving Cumberland River, Tennessee and Kentucky, general river, 1832 to 1838.*

Act of—	
July 17, 1832 .....	\$30,000
June 23, 1834 .....	30,000
July 7, 1836 .....	20,000
March 3, 1837 .....	55,000
July 7, 1838 .....	20,000
	<hr/>
Total .....	155,000

*Improving Cumberland River below Nashville, Tenn., under old project for open-channel work, from 1871 to 1890.*

Act of—		Act of—	
March 3, 1871 .....	\$30,000	August 5, 1882 .....	\$15,000
June 10, 1872 .....	20,000	July 5, 1884 .....	7,500
March 3, 1873 .....	25,000	August 5, 1886 .....	12,500
March 3, 1875 .....	25,000	August 11, 1888 .....	10,000
June 18, 1878 .....	45,000	September 19, 1890 .....	40,000
March 3, 1879 .....	40,000		
June 14, 1880 .....	20,000	Total .....	305,000
March 3, 1881 .....	15,000		

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*Under new project for locks and dams, from 1892 to 1902.*

Act of—

July 13, 1892.....	\$40,000.00
August 18, 1894.....	30,000.00
June 3, 1896.....	80,000.00
March 3, 1899.....	100,000.00
Amended act of June 13, 1902.....	180,000.00
<b>Total.....</b>	<b>430,000.00</b>
Received on account of sales.....	961.95
<b>Aggregate.....</b>	<b>430,961.95</b>

## CONTRACTS IN FORCE.

*Improving Cumberland River above and below Nashville, Tenn.*

- For construction of 1 dredge, at \$18,650.  
Contractor: Featherstone Foundry and Machine Company.  
Date of contract: December 15, 1902.  
Date of approval: January 8, 1903.  
Date of beginning work: June 2, 1903.  
Date of expiration: May 1, 1903. (Time limit has been waived, as authorized by the Chief of Engineers, United States Army, April 25, 1903.)
- For construction of 2 steam tenders, at \$4,535 each; 2 dump scows, at \$3,650 each; 6 decked barges, at \$1,503 each, and two derrick-boat hulls, at \$1,440 each.  
Contractor: Ed. J. Howard.  
Date of contract: January 26, 1903.  
Date of approval: February 17, 1903.  
Date of beginning work: March 2, 1903.  
Date of expiration: May 1, 1903. (Time limit has been waived, as authorized by the Chief of Engineers, United States Army, April 25, 1903.)

## COMMERCIAL STATISTICS.

*Cumberland River below Nashville, Tenn., from January 1 to December 31, 1902.*

	Tons.		Tons.
Logs.....	24,447	Bricks.....	1,062
Lumber.....	6,898	Sand.....	10,422
Railroad ties.....	166,831	Lime.....	100
Hoop poles.....	1,000	Cement.....	268
Heading.....	625	Explosives.....	2,150
Staves.....	2,100	Crude materials for explosives.....	1,600
Shingles.....	80	Hogs.....	875
Tan bark.....	100	Horses.....	400
Tobacco.....	25,000	Mules.....	480
Peanuts.....	50	Cattle.....	2,000
Salt.....	453	Sheep.....	58
Flour.....	404	Fertilizer.....	800
Produce.....	3,080	Spokes.....	2,100
Hay.....	3,140	General merchandise.....	11,550
Grain.....	12,200		
Coal.....	1,020	<b>Total tonnage.....</b>	<b>283,531</b>
Iron.....	2,290		
Estimated value.....			\$7,847.047
Passengers carried.....			25,000

*List of steamboats (stern wheel) plying on the Cumberland River below Nashville, Tenn., calendar year 1902.*

Name.	Registered dimensions.			Net tonnage.
	Length.	Breadth.	Depth.	
	<i>Feet.</i>	<i>Feet.</i>	<i>Feet.</i>	
Lora .....	70	12	2.5	44
Victor .....	120	26	4	100
Penguin .....	80	16.6	3.4	60
T. L. Herbert .....	117	24	3.6	80
Thos. Parker .....	100	18.1	4.5	57
Dick Clyde .....	95.8	17.4	3.9	76
Wilford .....	85	18.8	8	47
Inverness .....	129	21	4.8	121
Margaret .....	142	26	4.6	201
J. T. Duffy, jr. ....	120	26	3.8	146
Pavonia .....	120	26	4	132
Maud Kilgore .....	115	23	3.5	82
John S. Summers .....	108.2	21.3	3.4	66
J. B. Richtman .....	121	23.5	3.9	132
Ten Broeck .....	130	26	3.9	148
J. M. Bowell .....	120.6	22.9	4.3	94
A. L. Goldberg .....	129	20	3	58
Sycamore .....	103.6	20.3	3	69
J. B. Richardson .....	165	29	4	191
H. W. Buttorff .....	160	30	4.1	160

(b) ABOVE NASHVILLE, TENN.

The distance from Nashville to Cumberland Ford (Pineville) is about 497 miles, and from Nashville to head of Smith Shoals, mouth of Rockcastle River, is 357 miles. The head of navigation is at Burnside, Ky., 325 miles above Nashville, Tenn., with a fall of 223 feet.

A general description of the upper Cumberland, showing the character of its obstructions and of its navigability for steamboats, is given in Report of the Chief of Engineers, 1896, page 1909.

For detailed description of Cumberland River above Nashville see Reports of the Chief of Engineers, 1871, pages 468-485; 1872, pages 462-472.

The amount expended under existing project during fiscal year ending June 30, 1903, is \$26,998.44, the disbursements being classified as follows:

General improvement:

Lock No. 1 .....	\$784.44
Lock No. 2 .....	8,548.88
Lock No. 3 .....	1,741.87
Lock No. 4 .....	2,519.91
Channel work .....	380.73
	<hr/> \$13,975.33

Locks 5, 6, and 7:

Lock No. 5 .....	2,423.77
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Locks and Dams Nos. 1, 5, 6, and 7:

Lock No. 1 .....	\$8,350.42
Lock No. 5 .....	255.70
Channel work .....	1,993.22
	<hr/> 10,599.34

Total ..... 26,998.44

Operations were carried on at the following localities:

*Lock No. 1.*—Messrs. James E. Sloan & Co., contractors for construction of locks, approaches, and abutment protection, finished work of clearing off site and grounds, thus completing contract. The amount of retained percentage, \$8,214.72, was paid September 6, 1902. For statements concerning gates, operating mechanism, and filling valves for this lock, and for contracts for floating plant to be used on

the Cumberland River, both above and below Nashville, see report on Cumberland River below Nashville.

*Lock No. 2.*—Work was begun in August and suspended in December on account of high-water stage. A low retaining wall was built below the lock to prevent caving of the bank. The bank was ripped and repairs were made to temporary buildings and to the Government road. Quantities were as follows:

	Cubic yards.
Gravel screened and washed .....	500
Sand screened and washed .....	100
Excavation .....	2,000
Concrete wall put in .....	500
Rubble wall built .....	533

*Lock No. 3.*—The work of constructing abutment was begun in June. At the close of the year the force had been organized, material collected, derricks erected and machinery placed, minor repairs to quarters made, Government road from the lock site to the county road repaired, and abutment site cleared. This abutment will be built of concrete.

*Lock No. 4.*—The work of constructing the abutment was begun in May. At the end of June the preparatory work, consisting of minor repairs to quarters and to the Government road, overhauling tram track from the river to the quarry, and erecting derricks, had been completed and quarrying stone begun. Quantities were as follows:

	Cubic yards.
Stripping quarry .....	855
Stone quarried .....	127
Stone trammed .....	300
Sand delivered .....	250

*Lock No. 5.*—Work done at Lock 5 consisted of riprapping bank above and below the lock, repairing derrick boat and snag boat, and caring for floating plant. Five hundred and forty-six cubic yards of riprap were quarried. Work was suspended in August, 1902.

*Steamer Cumberland.*—The electric lighting plant was overhauled and searchlight reflectors replated. The boat was in commission from December 1 to 12, 1902, towing the floating plant from Lock 5 to Lock A, and from May 10 to June 20, 1903, transferring necessary plant to Locks 3 and 4 and towing snag boat to Burnside.

*Snagging.*—The snag boat *Apex* during the fiscal year did the following work:

Snags removed .....	506
Snags cut .....	373
Leaning trees cut .....	373
Trees deadened .....	13
Logs cut .....	103

These operations cover a period from August 28 to September 30, 1902, snagging from Lock 5 to Nashville, and from June 17 to 30, 1903, snagging from Burnside, Ky., to Rowena, Ky., a distance of 122 miles. At the close of the fiscal year operations were still in progress and will be continued downstream to Lock No. 3.

The balance available June 30, 1903, will be applied to the completion of Lock and Dam No. 1, and putting same in operation, to completion of abutments at Locks 3 and 4, and to maintenance of improved channel.

The additional appropriation recommended below should be applied

to putting in operation Locks 2, 3, 4, and 5, by construction of dams and erection of gates.

*Money statement.*

July 1, 1902, balance unexpended.....	\$270,689.83
June 30, 1903, amount expended during fiscal year.....	26,998.44
July 1, 1903, balance unexpended.....	243,691.39
July 1, 1903, outstanding liabilities.....	26,926.39
July 1, 1903, balance available.....	216,765.00
July 1, 1903, amount covered by uncompleted contracts.....	23,459.00
Amount (estimated) required for completion of existing project ..	6,605,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903:	
For works of improvement.....	\$495,000.00
For maintenance of improvement.....	5,000.00
	500,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

APPROPRIATIONS.

*Improving Cumberland River above Nashville, Tenn., under original projects for open-channel work, from 1876 to 1884.*

Geographical division.	Act of—			
	Aug. 14, 1876.	June 18, 1878.	Mar. 3, 1879.	June 14, 1880.
1. Nashville to Kentucky line.....	\$15,000	\$20,000	\$18,000	\$15,000
2. Kentucky line to Smith shoals.....	10,000	8,000	6,000	10,000
3. Smith shoals.....	25,000	30,000	15,000	20,000
4. Smith shoals to Falls of Cumberland.....	2,000	2,000		
Total.....	52,000	60,000	39,000	45,000

Geographical division.	Act of—			Total.
	Mar. 3, 1881.	Aug. 2, 1882.	July 5, 1884.	
1. Nashville to Kentucky line.....	\$15,000			\$33,000
2. Kentucky line to Smith shoals.....	15,000			49,000
3. Smith shoals.....	10,000	\$15,000		115,000
4. Smith shoals to Falls of Cumberland.....				4,000
5. Above mouth of Jellico, Kentucky.....	10,000	5,000		15,000
6. Nashville to Smith shoals.....		30,000		30,000
7. Nashville to head of Smith shoals.....			\$50,000	50,000
Total.....	50,000	50,000	50,000	348,000

*Improving Cumberland River above Nashville, Tenn., under the present project for a system of locks and dams from Nashville, Tenn., to head of Smith shoals, mouth of Rockcastle River, Kentucky.*

Act of—		Act of—	
August 5, 1886.....	\$75,000.00	March 3, 1899.....	\$100,000.00
August 11, 1888.....	200,000.00	Amended act of June	
September 19, 1890.....	250,000.00	13, 1902.....	200,000.00
July 13, 1892.....	250,000.00	Total.....	1,895,000.00
August 18, 1894.....	200,000.00	Amount recovered from	
June 3, 1896.....	20,000.00	failing contractor.....	450.17
June 4, 1897 (sundry		Aggregate.....	1,895,450.17
civil act).....	350,000.00		
July 1, 1898 (sundry			
civil act).....	250,000.00		

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## CONTRACTS IN FORCE.

### *Improving Cumberland River above Nashville, Tenn.*

Construction of lock approaches and abutment protection.

Contractor: James E. Sloan & Co.

Date of contract: September 12, 1899.

Date of approval: September 29, 1899.

Date of beginning work: October 9, 1899.

Date of expiration: December 31, 1901. (Original date of expiration, December 31, 1899, extended to December 31, 1900, and again extended to December 31, 1901. Time limit waived for a reasonable period to allow cleaning up of lock site and grounds. Contract closed and terminated September 6, 1902.)

For list of other contracts in force see report Cumberland River below Nashville.

## COMMERCIAL STATISTICS.

### *Cumberland River above Nashville, Tenn., from January 1 to December 31, 1902.*

	Tons.		Tons.
Logs .....	63,501	Iron .....	2,000
Lumber .....	16,826	Bricks .....	1,000
Timber .....	4,003	Sand .....	26,325
Cedar poles and posts .....	2,997	Lime .....	113
Railroad ties .....	5,922	Cement .....	150
Hoop poles .....	1,300	Explosives .....	300
Heading .....	696	Hogs .....	3,245
Staves .....	22,750	Horses .....	240
Shingles .....	75	Mules .....	200
Wood .....	800	Cattle .....	1,020
Tobacco .....	2,755	Sheep .....	23
Salt .....	1,810	Fertilizers .....	2,000
Flour .....	812	Peanuts .....	1
Produce .....	8,040	Oil-well machinery .....	900
Hay .....	850	General merchandise .....	12,915
Grain .....	6,501		
Coal .....	1,600	Total tonnage .....	192,270
Estimated value .....			\$5,527,886
Passengers carried .....			29,265

### *List of steamboats (stern-wheel) plying on the Cumberland River above Nashville, Tenn., and in Kentucky, calendar year 1902.*

Name.	Registered dimensions.			Net tonnage.
	Length.	Breadth.	Depth.	
	<i>Feet.</i>	<i>Feet.</i>	<i>Feet.</i>	
T. L. Herbert .....	117	24	3.6	80
J. N. White .....	147	27	3	77
Henry Harley .....	180	29	3.2	162
Burnside .....	136	21	4.6	92
Burkesville .....	116.5	17.1	3.8	59
Albany .....	120	26	4	52
A. L. Goldberg .....	120	20	3	56
A. L. Joy <sup>a</sup> .....	53	9	1.4	8
Samuel H. Anderson <sup>a</sup> .....	50	8.5	1.4	5
E. Campbell <sup>a</sup> .....	50	8	1.3	4.5
Eadsville <sup>a</sup> .....	44	8	1.4	2
R. Dunbar .....	180	29.4	6.1	156
Rob Dudley .....	180	29	3.8	150

<sup>a</sup> Gasoline.



## D D 3.

## REMOVING SUNKEN VESSELS OR CRAFT OBSTRUCTING OR ENDANGERING NAVIGATION.

*Wreck of steamer W. K. Phillips in Dover Island Chute, Lower Cumberland River.*—The steamer *W. K. Phillips* sank on or about December 14, 1897, in the north chute of Dover Island, Cumberland River, and was reported as dangerous to navigation September 10, 1900. Removal was authorized October 6, 1900, but owing to impracticability of sending out working party the removal was not commenced until October 27, 1902, and completed November 10, 1902, at a cost of \$335.20. Final report was submitted to the Chief of Engineers November 13, 1902.



## APPENDIX E E.

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### IMPROVEMENT OF TENNESSEE RIVER AND ITS TRIBUTARIES.

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*REPORT FOR THE FISCAL YEAR ENDING JUNE 30, 1903, WITH OTHER DOCUMENTS RELATING TO THE WORKS. OFFICERS IN CHARGE, MAJ. JOHN G. D. KNIGHT AND CAPT. W. J. BARDEN, CORPS OF ENGINEERS.*

#### IMPROVEMENTS.

- |  |  |
|--|--|
| 1. Tennessee River.  | 3. French Broad and Little Pigeon rivers, Tennessee.             |
| 2. Operating and care of Muscle Shoals Canal, Tennessee River. | 4. Clinch, Hiwassee, and Holston rivers, Tennessee and Virginia. |
- 

ENGINEER OFFICE, UNITED STATES ARMY,  
*Chattanooga, Tenn., July 15, 1903.*

GENERAL: I have the honor to transmit herewith \* \* \* the annual report for the works of river and harbor improvement in my charge for the fiscal year ending June 30, 1903.

This report was mainly prepared by Maj. John G. D. Knight, Corps of Engineers, who was in charge of the district until April 25.

Very respectfully, your obedient servant,

W. J. BARDEN,  
*Captain, Corps of Engineers.*

Brig. Gen. G. L. GILLESPIE,  
*Chief of Engineers, U. S. A.*

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#### E E 1.

### IMPROVEMENT OF TENNESSEE RIVER.

The Tennessee River is 651 miles long. Two hundred and sixty-three miles above its mouth are shoals which have necessitated the construction of a canal in two sections, of a total length of 16 miles, provided with 11 locks. This canal affords the only practicable route for boat communication between the upper and lower sections. The river is navigable the entire year to Riverton, 226 miles above the mouth.

There is no through traffic throughout the entire length of the river, but for a part of the year two boats run between Chattanooga and Paducah, Ky., at the mouth of the river, a distance of 459 miles. Local boat lines have headquarters at Knoxville, Kingston, Chattanooga, and Decatur.

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Through traffic the entire year can only be rendered possible by a system of locks and dams, the construction of which does not seem to be justified by any increase of traffic now probable.

The construction of the Colbert Shoals Canal, now in progress, will extend navigation for the entire year 10 miles above Riverton.

There are three sections of the river where, by reason of present local traffic, amounting to about 282,157 tons annually, it may be advisable to facilitate all the year traffic by locks and dams which might form a part of a comprehensive system between Riverton and headwaters in the future should the entire system ever be justified. These three sections are in the vicinity of Knoxville, for about 10 miles below the mouth of the Clinch River, and between Gunter'sville and Hobbs Island. The last-named section, however, should be omitted in case a railroad bridge is built across it.

The special features of the river are given in the Annual Report of the Chief of Engineers, 1901, Part III, page 2419.

From commercial statistics, given later in detail, it will be seen that the total tonnage of freight moved on the Tennessee River during the calendar year 1902 was 1,669,593 tons. Of this 134,632 tons were rafted.

The movement of the balance may be thus summarized:

Distance on Tennessee River between terminal points of carriers' routes.	Freight moved.
	<i>Tons.</i>
Over 450 miles .....	2,806
200 to 290 miles .....	704,362
100 to 200 miles .....	165,783
50 to 100 miles .....	45,415
4 to 50 miles .....	321,875
Under 4 miles .....	296,080
Total .....	1,534,961

The amount so far appropriated and allotted for the Tennessee River and the canals thereon, including the amount for operating canals, is \$6,779,181.85; of this sum \$789,676.04 has been allotted for operating and care and repair of the Muscle Shoals Canal from November, 1890, when it was opened to navigation, to June 30, 1903.

For purposes of appropriations the river has been divided into the following different sections, where are given additional details.

### 1. ABOVE CHATTANOOGA (188 MILES).

The plan of improvement, based upon the survey of 1891, is to obtain a 3-foot average low-water channel at a cost of \$650,000 additional to prior expenditures. It received Congressional approval August 18, 1894.

Work under this plan consists of removing obstructions and the construction of wing dams and training walls. Permanently beneficial results do not always ensue.

During the past year, after consulting those who were immediately concerned in the improvement of this section of the river, it was determined to apply available funds to work on about 12 miles of the river from about 6 to 18 miles below the mouth of the Clinch. A small portion of the appropriation is to be reserved until the necessity for work at Richland Creek is fully determined. The work executed during the year was as follows:

There were built, by hired labor and purchase of material in open market, 1 quarter boat, 1 steam-derrick boat, 1 tender for same, 1 tool boat, and 3 barges, and extensive repairs were made to the fleet, which had been idle for two years on account of lack of appropriations. On the 8th of August the dredging plant was taken to Rockwood Landing and continued at work in that vicinity until January 21, 1903, when cold weather caused a suspension of the work and the fleet was taken to Knoxville for the winter. Work was resumed in May, 1903.

The following work was done:

*Rockwood Landing.*—Two thousand cubic yards of material were dredged from the channel and 60 trees were cut.

*Kings bar, about 3 miles above Rockwood Landing.*—The obstructions consist of sand and gravel overlying solid rock reefs which crop out at intervals in the channel. In the latter part of August the dredge was put to work here. Some of the most prominent reefs were blasted off. Work done was as follows: Dredging, 300 cubic yards; trees cut, 345; rock blasted, 1,715 cubic yards; stone taken from channel, 375 cubic yards; logs removed, 575.

*Bracketts bar, about 1 mile below Rockwood Landing.*—This is composed of gravel, bowlders, and loose limestone, some of which were too large to be taken up by the dredge dipper and had to be removed by the steam derrick boat. Underlying the gravel is a slaty stratum varying in thickness from 3 inches to 8 inches, which is very hard to dig. It is proposed to make a channel here about 1,900 feet long and not less than 3 feet deep at low water. Work was prosecuted here until January 21, 1903, and the proposed channel was about two-thirds completed.

Work was resumed in June, 1903. The work accomplished was as follows: Dredging, 19,935 cubic yards; stone taken from channel, 490 cubic yards; rock blasted from channel, 700 cubic yards.

*Head of Half Moon Island.*—During November and December, 1902, a party was put to work at the head of Half Moon Island excavating a passage through a solid rock reef that crossed the channel near the left bank. The blasted material was utilized in mending the dams at the head of the island. The material not being sufficient for that purpose a quarry was opened, the stone from which was used in completing the repair of the dams. Some of the material from Bracketts bar was also used to calk leaks. The quantity of stone quarried was 1,383 cubic yards, and the quantity placed on dams was 2,405 cubic yards.

*Soddy shoals.*—On the 23d of May the steamer *Long*, 1 quarter boat, and 3 barges were sent to Soddy shoals, a distance of 163 miles below Knoxville, to repair a break in the dam at the head of Soddy Island. This break was 236 feet in length, and had caused about 50 feet of the head of the island to be washed away. A quarry was opened in the vicinity and the stone boated down to the break, which was closed, and the head of the island riprapped. For these purposes 1,548 cubic yards of stone were quarried.

While it is stated below that \$50,000 can be profitably expended on this section of the river in the fiscal year ending June 30, 1905, it is also recommended that an appropriation of \$15,000 be made to be applied in making surveys for locations and estimates of cost of one lock and dam a short distance below Knoxville and for possibly three locks and dams in the 20 miles of the river below the mouth of the Clinch.

This recommendation results from a consideration of the local traf-

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fic about Knoxville, which during the year 1902 amounted to 136,264 tons, and of that about Rockwood to the amount of 103,807 tons. (See commercial statistics which follow the report as to section 3 of the river.) If these locks and dams were built navigation of these two portions of the Tennessee and the lower portions of the French Broad and of the Clinch rivers would be possible all the year.

Should the local traffic, amounting in 1902 to over 50,000 tons, on the section of the river from Dayton Landing to White Creek Landing, 40 miles in length, continue to increase as rapidly as at present the expense of a similar survey and detailed estimate of cost of improvement of that section by locks and dams would be justified.

## Money statement.

July 1, 1902, balance unexpended .....	\$50,030.02
June 30, 1903, amount expended during fiscal year .....	30,589.43
July 1, 1903, balance unexpended .....	19,440.59
July 1, 1903, outstanding liabilities .....	1,528.73
July 1, 1903, balance available .....	17,911.86
(Amount (estimated) required for completion of existing project .....	505,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903:	
For works of improvement .....	\$45,000.00
For maintenance of improvement .....	5,000.00
	50,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

## APPROPRIATIONS.

Act of—		Act of—	
April 10, 1869 .....	\$35,000	August 2, 1882 .....	\$7,000
March 3, 1871, transferred from below Chattanooga. ....	35,000	July 5, 1884 .....	3,000
June 10, 1872 .....	25,000	August 5, 1886 .....	7,500
March 3, 1873 .....	25,000	August 11, 1888 .....	15,000
June 23, 1874 .....	25,000	September 19, 1890 .....	30,000
March 3, 1875 .....	40,000	July 13, 1892 .....	25,000
August 14, 1876 .....	15,000	August 18, 1894 .....	50,000
June 18, 1878 .....	15,000	June 3, 1896 .....	15,000
March 3, 1879 .....	11,500	March 3, 1899 .....	30,000
June 14, 1880 .....	10,000	June 13, 1902 .....	50,000
March 3, 1881 .....	7,000	Total .....	476,000

## 2. CHATTANOOGA, TENN., TO RIVERTON, ALA. (237.3 MILES).

Obstructions to the navigation of this section are to be found in the mountain region for about 25 miles below Chattanooga; at sundry shoal places thence down to the Muscle Shoals Canal; between the upper and lower sections of the canal; at Little Muscle Shoals, between the canal and Florence; between Florence and the Colbert Shoals Canal, now in progress, and at the two shoals to be avoided at low water by this canal.

Navigation the entire year can only be had by the canalization of much of this section, which work is not now justified.

(a) *Chattanooga, Tenn., to Florence, Ala. (207.5 miles).*—But improvements on a lesser scale are imperatively demanded. A freight and passenger boat transfer service is maintained between Gunter'sville and Hobbs Island, a distance of 22 miles. During the year 1902 there were transferred by these boats 42,086 tons of freight and 7,635 passengers. Shoaling occurs on this section of the river, and the amount of traffic involved demands that the Government should aid in facilitating it.

Again at Sweetwater bar shoaling continually recurs, due to the large amount of detritus brought down by Sweetwater Creek.

Fifteen thousand dollars are needed for removing shoals at these two places and for other contingencies.

Sweetwater bar is in the right channel of the river, which channel extends above Florence a distance of 5 miles behind a chain of islands, and is much narrower than the left channel, which is obstructed by a succession of shoals and not navigable. At the head of the left channel are two dams in bad repair and in part broken, whose object was to increase the flow through the right channel. In consequence of the condition of these dams an undue proportion of water flows down the left channel to the decided detriment of the right channel. An examination has been made, and the estimated cost of the repair of the dams, cutting overhanging trees, and other minor improvements in this locality is \$3,000. If these repairs be not executed it seems highly probable that at no distant day the navigation of the right channel at low-water stages will be impracticable.

The needs, then, of this section are \$18,000 for the works above described.

No appropriation for this section of the river has been made since March 3, 1899. The balance available at the beginning of the fiscal year was \$2,480.21, which was practically exhausted in dredging a channel 80 feet wide through a bar which had formed at Florence Bridge. From this bar 7,630 cubic yards of bowlders and rocks were removed and placed so as to form a dam about 3 feet high at low water, designed to deflect the current in a direction favorable to navigation. The cost of the work, including the removal of a number of snags, was \$2,086.38.

In March, 1903, an allotment of \$6,000 was made from the emergency river and harbor act of June 6, 1900, to be applied to dredging at Sweetwater bar. As soon as the stage of water permitted, the U. S. dredge *Kentucky* and outfit were transferred from Lock 6 of the Muscle Shoals Canal to the bar, and began work April 8. From that time until May 11, 15,500 cubic yards of material, consisting of sand, loose rock, bowlders, and gravel, were removed. Before the improvement could be completed the river had fallen to so low a stage that it was necessary to take the dredge to the lower river while it was still possible to cross the Colbert shoals.

The work done at Sweetwater, while incomplete, affords great relief to navigation at that point, as it increases the area of cross section about 50 per cent, distributing the fall and deepening the crossing. The cost of the work to June 30 was \$2,963.97, and it is expected that the entire balance of the allotment of \$6,000 will be needed to complete the dredging and protect the bank of the island opposite the mouth of the creek, where considerable scouring has occurred.

It is probable that dredging at this bar will be required annually.

More details of this section of the river are found on pages 2423-2425 of the Annual Report of the Chief of Engineers for 1901.

(b) *Florence, Ala., to Riverton, Ala. (29.8 miles).*—The main obstructions to this section are by shoals extending along the lower 8 miles of it, with a total fall over them of 25 feet at low water, when the available depth is about 1.5 feet. These obstructions are to be avoided at all stages when there is less than 7 feet over the shoals by a canal in and along the left bank.

The project for this canal, as modified in 1892, contemplated raising its river bank to a height of 3 feet above any known high water and the use of the canal at all river stages. In 1897 the river rose nearly 2.5 feet higher than ever before recorded. To carry the river bank 3 feet above this stage of water would greatly increase the cost of the canal. So further study was given to the plans, and September 5, 1901, it was recommended that the canal be so constructed as to be in part submerged when there was a 7-foot stage over the shoals. This recommendation was approved October 5, 1901.

A further modification was submitted September 17, 1902, and the entire subject of the improvement of the river at Colbert and Bee Tree shoals was then referred to a Board of Engineer officers.

December 10, 1902, the plan as it now stands was submitted from this office, and received the approval of the Secretary of War February 17, 1903. Its main differences from earlier plans are the location of the upper section of the canal in the river bed instead of in the bank, with a resulting construction of a river wall, and the location of the guard lock at the lower end instead of at the upper end of this section. The estimated cost of completion is \$2,200,000.

Specifications were at once prepared, and March 2, 1903, proposals were invited for constructing all the river section and the guard lock of the canal. April 11, 1903, proposals were opened, and April 14, 1903, it was recommended that the lowest bid be accepted, but only for so much of the canal section above the guard lock as could be built within the amount authorized by Congress. This amount was \$50,000, to be appropriated later, added to about \$545,000 of available funds. This recommendation was approved, and contract was entered into on May 5 and approved on May 16.

The contractor arrived at the work June 9 with a small force of men and began preliminary work by accumulating tools and appliances, building an office, quarters, etc., for the use of his force, repairing a wagon road from Riverton—the nearest railway station—to the place of work, erecting blacksmith shop, and hauling logs, and sawing timber for cofferdam.

The masonry work of the liftlock of this canal is completed. Between March 3, 1899, and June 13, 1902, no appropriation for continuing the canal construction was made. By the river and harbor act of the latter date \$200,000 was appropriated for the work, and contracts were authorized to an additional amount of \$400,000. Of this last amount \$350,000 was appropriated March 3, 1903.

To complete this canal an additional appropriation of \$1,650,000 is necessary. As contracts amounting to \$50,000 of this sum are now authorized, it is urged that authority be given to enter into contracts amounting to \$1,600,000, the work contracted for to be paid for as appropriations may from time to time be made by law; also that one-third of the amount needed to complete this canal be appropriated during each of the next three sessions of Congress.

Only the lack of funds prevents work being carried on on the lower section of the canal and on the machinery and gates of both locks simultaneously with the construction of the upper section.



*Money statement.*

July 1, 1902, balance unexpended .....	\$211,544.47
Amount appropriated by sundry civil act approved March 3, 1903 ..	350,000.00
Amount allotted from appropriation for emergencies in river and harbor works .....	6,000.00
	<hr/>
	567,544.47
June 30, 1903, amount expended during fiscal year .....	15,169.21
	<hr/>
July 1, 1903, balance unexpended .....	552,375.26
July 1, 1903, outstanding liabilities .....	6,592.50
	<hr/>
July 1, 1903, balance available .....	545,784.76
	<hr/>
July 1, 1903, amount covered by uncompleted contracts .....	500,000.00
	<hr/>
{ Amount (estimated) required for completion of existing project ...	5,165,326.68
{ Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903 .....	550,000.00
{ Submitted in compliance with requirements of sundry civil act of June 4, 1897.	

## APPROPRIATIONS.

March 2, 1827 (survey) .....	\$200.00
June 9, 1860 (claim) .....	1,350.00
July 25, 1868 .....	85,000.00
April 10, 1869 .....	5,095.00
July 11, 1870 .....	45,000.00
June 10, 1872 .....	50,000.00
March 3, 1873 .....	100,000.00
June 23, 1874 .....	100,000.00
March 3, 1875 .....	360,000.00
August 14, 1876 .....	255,000.00
June 18, 1878 .....	300,000.00
March 3, 1879 .....	210,000.00
June 14, 1880 .....	300,000.00
March 3, 1881 .....	250,000.00
August 2, 1882 .....	250,000.00
July 5, 1884 .....	350,000.00
August 5, 1886 .....	262,500.00
August 11, 1888 .....	250,000.00
September 19, 1890 .....	450,000.00
July 13, 1892 .....	475,000.00
August 18, 1894 .....	275,000.00
June 3, 1896 .....	50,000.00
March 3, 1899 .....	135,000.00
June 13, 1902 .....	200,000.00
March 3, 1903 (sundry civil act) .....	350,000.00
March 23, 1903 (emergency river and harbor act) .....	6,000.00
	<hr/>
	5,115,145.00
Received on account of transfer settlement .....	3.91
	<hr/>
	5,115,148.91

## ABSTRACT OF CONTRACT WITH SHERIDAN-KIRK CONTRACT COMPANY, OF VALLEY VIEW, KY., FOR BUILDING SECTION OF COLBERT SHOALS CANAL.

Contract dated May 5, 1903; approved May 16, 1903.

Date of beginning work, June 20, 1903; date of expiration, September 20, 1905.

Concrete, \$8.28 per cubic yard; earth excavation, 50 cents per cubic yard; rock excavation, \$1.98 per cubic yard; iron and steel, 7 cents per pound; laying masonry,

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\$6 per cubic yard; riprap, \$2 per cubic yard; stone backing, \$10 per cubic yard; stone coping, \$24 per cubic yard; face stone, \$16 per cubic yard; special stone, \$24 per cubic yard; timber, \$50 per 1,000 feet, B. M.; test holes, 60 cents per linear foot

## 3. BELOW RIVERTON, ALA. (226 MILES).

The average slope of this section of the river is 0.315 foot per mile. This in itself would indicate that sufficient improvement may be effected by dredging. Such improvement would be permanent were the river entirely free from detritus. As it is not, particularly in the neighborhood of the mouths of several small tributaries, it is to be expected that dredging must be repeated from time to time.

In August, 1902, while the river was too low for dredging operations, the U. S. S. *McPherson* with a snag barge was sent from Riverton, Ala., to the mouth of the river at Paducah, Ky., to clear the channel; 211 snags were pulled, many of which were in dangerous proximity to the channel.

The office was notified that the channel which had been dredged at Rockport bar in September, 1901, had again become very shoal. An examination made in September, 1902, by the snagging party on its return from Paducah showed that in one year the channel, which had been dredged to a depth of 5 feet at extreme low water, had filled up for a length of 300 feet, so as to make a depth of only 3 feet.

The dredging plant was sent there in the latter part of May, and at the end of the fiscal year had removed 19,100 cubic yards of gravel, resulting in a channel 200 feet wide and 6 feet deep. The cost was 11.6 cents per cubic yard.

Dredging is necessary and should be continued on this section of the river, and for that purpose an estimate of \$40,000 is submitted.

### *Money statement.*

July 1, 1902, balance unexpended.....	\$19,000.00
June 30, 1903, amount expended during fiscal year.....	11,081.54
July 1, 1903, balance unexpended.....	7,918.46
July 1, 1903, outstanding liabilities.....	1,596.31
July 1, 1903, balance available.....	6,322.15
Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903:	
For works of improvement.....	\$35,000.00
For maintenance of improvement.....	5,000.00
	40,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

### APPROPRIATIONS.

[For Tennessee River below Riverton, Ala.]

September 19, 1890.....	\$25,000
July 13, 1892.....	25,000
August 18, 1894.....	125,000
March 3, 1899.....	100,000
June 13, 1902.....	19,000
Total.....	294,000

## COMMERCIAL STATISTICS.

*Tennessee River above Chattanooga, Tenn. (188 miles).*

Articles.	Year ending Dec. 31, 1902.	
	Tons.	Estimated value.
Brick	178	\$768
Coal	8,015	18,033
Cotton	105	18,900
Cotton seed	82	1,712
Fertilizer	1,766	35,320
Flour	1,214	51,535
General merchandise	6,789	791,996
Grain	33,126	443,780
Hay	5,806	99,817
Iron ore	151,000	226,500
Live stock	886	141,760
Logs and wood	79,311	616,418
Lumber	7,473	93,412
Marble	68,274	1,365,480
Produce	2,628	220,290
Railroad ties	1,456	3,435
Sand	97,500	65,000
Stone	1,610	8,050
Tan bark	1,049	14,526
Telephone poles	10,000	80,000
Total	478,268	4,236,822

Floated down in rafts, 87,801 tons.

Number of passengers transported (1902), 5,146.

Details of the traffic are shown in the following table:

Between what points.	Miles on Tennessee River.	Passen- gers.	Tons.
<b>Timber and lumber rafted:</b>			
Headwaters of Clinch and Powell rivers to Chattanooga	103.5		57,612
Out of Obed River to Chattanooga	103.5		2,000
Rockwood Landing to Chattanooga	89		150
Out of Clinch River to Knoxville	80		5,093
Dandridge to Loudon	60.7		210
Out of Ocoee River to Chattanooga	35.5		6,000
Charleston, Tenn., to Chattanooga	35.5		10
Loudon to Kingston	23.8		500
Headwaters of Little Tennessee River to Loudon and Lenoir City	10		1,500
Headwaters of Holston River to Knoxville	4.5		7,840
Out of French Broad and Big Pigeon rivers to Knoxville	4.5		6,896
<b>Floated down in barges:</b>			
Leipers Ferry, Tenn., to Lenoir City	5.5		1,995
Out of French Broad River, Seven Islands to Knoxville	4.5		37
Marble quarries on French Broad River to Knoxville	4.5		1,610
<b>Moved by steamboats:</b>			
Loudon and Chattanooga	127	47	67
Harriman and Chattanooga	103.5		2,800
Kingston and Chattanooga	103.5	2,136	58,439
Leadvale and Kingston	84.5	340	6,047
Knoxville and Kingston	80	235	3,473
Loudon and Euchee, Tenn.	51		340
Lenoir City and Rockwood	48		425
White Creek mines to ore dock at mouth of Richland Creek	40		50,000
Mouth of Ocoee River and Chattanooga	35.5	638	10,027
Lenoir City and Harriman	34	150	733
Loudon and Kingston	23.8	400	3,301
Rockwood Landing and Round Island mines	19		102,780
Rockwood Landing and Kingston	14.5	100	1,027
Marble quarries near Concord, Tenn., and Knoxville	12		
Marble quarries on French Broad River and Knoxville	4.5	350	136,264
Knoxville and Leadvale, Tenn.	4.5	250	5,099
Rockwood Landing and Ironton ore docks	4		5,000
Total		5,146	478,268

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Of the 9 steamboats reported in the last annual report as plying on the Tennessee River above Chattanooga, Tenn., the *Charles H. Bacon* and *Joe Wheeler* were not in this service during the year, but the number of barges was increased from 48 to 66.

Four additional boats were put on, as follows:

Names of steamboats.	Length.	Width.	Depth.	Net tonnage.	Height of pilot house.	Height of smoke-stack.	Number of barges.	Capacity of barges.
	<i>Feet.</i>	<i>Feet.</i>	<i>Feet.</i>		<i>Feet.</i>	<i>Feet.</i>		<i>Tons.</i>
City of Loudon.....	75	12	2	23	17	20	2	60
Gasconade.....	107.4	23.9	3.5	74	30	45	1	195
N. B. Forrest.....	138	25	3.5	134	35	40	1	125
Sam A. Connor.....	94.5	16	2.6	63	25.5	32.5	2	70

The total number of craft operating in this section of the river during the year ending December 31, 1902, was 11 steamboats, of a total of 738 tons burden net, and 66 barges, of a total capacity of 6,277 tons, as shown on list below.

Seven steamboats, the *Bill Tate*, *Flora Swann*, *City of Loudon*, *Clinch*, *Gasconade*, *N. B. Forrest*, and *W. T. Gallaher*, a total of 407 tons burden, and 33 barges, total capacity 3,019 tons, are also reported as plying on the Clinch River. The *Bill Tate* and *Flora Swann*, a total of 125 tons burden, and 27 barges, total capacity 1,865 tons, are also reported as plying on the French Broad River.

The Roane Iron Company, which operates two furnaces at Rockwood, Tenn., has purchased the steamer *Grady* and built a transport with a capacity of 8 cars to transport iron ore from the mines located behind Half Moon Island to Rockwood Landing, where the cars are transferred to a narrow-gauge railroad and carried a distance of 7 miles to the furnaces.

## List of boats and barges navigating the Tennessee River above Chattanooga, Tenn., during the year 1902.

Name.	Net tonnage.	Barges.		Between what points.	Miles on Tennessee River.
		Number.	Tonnage.		
Clinch.....	24	3	275	Loudon and Chattanooga.....	127.8
Gasconade.....	74	1	125	} Kingston and Chattanooga.....	108.5
N. B. Forrest.....	134	1	125		
W. T. Gallaher.....	27	3	150	Harriman and Chattanooga.....	108.5
Bill Tate.....	68	7	385	} Leadvale and Kingston.....	84.5
Flora Swann.....	57	8	440		
Bill Tate.....		1	107	Knoxville and Kingston.....	80
Sam A. Connor.....	63	2	70	Mouth of Ocoee River and Chattanooga.....	36.5
W. T. Gallaher.....		3	150	Lenoir City and Harriman.....	84
City of Loudon.....	28	2	60	Kingston and Loudon.....	23.8
Grady.....	137	4	1,200	Rockwood Landing and Round Island mines.	19
W. T. Gallaher.....		2	600	Rockwood Landing and Kingston.....	14.5
Isabella King.....	89	4	380	Marble quarries near Concord, Tenn., and Knoxville.	12
Oliver King.....	42	4	380	Marble quarries on French Broad River and Knoxville.	4.5
Bill Tate.....		6	270	} Leadvale and Knoxville.....	4.5
Flora Swann.....		6	270		
Grady.....		4	700	} Rockwood Landing and Ironton ore docks.	4
W. T. Gallaher.....		2	600		
		1	15	Seven Islands (Tennessee River) and Knoxville.	18.5
		1	5	Leepers Ferry and Lenoir City.....	5.5
		1	10	Marble quarries on French Broad River and Knoxville.	4.5
Total.....	738	66	6,277		

APPENDIX E E—REPORT OF CAPTAIN BARDEN.

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*Tennessee River, between Chattanooga, Tenn., and Florence, Ala.*

Articles.	Year ending Dec. 31, 1902.	
	Tons.	Estimated value.
Brick .....	500	\$2,246
Coal .....	1,201	2,582
Cotton .....	5,869	1,056,330
Cotton seed .....	3,282	68,924
Fertilizer .....	2,340	46,800
Flour .....	7,837	333,063
General merchandise .....	24,207	3,018,000
Grain .....	3,875	161,629
Hay .....	684	11,907
Iron, pig .....	951	23,775
Live stock .....	1,209	193,440
Logs and wood .....	61,582	330,160
Lumber .....	14,630	183,250
Produce .....	1,512	111,083
Railroad ties .....	94	225
Sand .....	6,135	4,000
Staves .....	805	9,600
Stone .....	829	8,200
Tan bark .....	130	1,800
Total .....	137,861	5,567,464

Number of passengers transported (1902), 18,139.

Of the traffic for 1902, 19,507 tons were moved by raft, 14,360 by flatboat, and 7,635 passengers and 42,086 tons of freight by railroad transfer boats between Hobbs Island and Guntersville, Ala., a distance of 22 miles. Of the remaining 61,908 tons, 2,806 were carried by the through boat plying between Chattanooga, Tenn., and Paducah, Ky.

Tabulated details of rafting for 1902 are shown by the following table:

	Miles.	Tons.
<b>Logs:</b>		
Chattanooga to South Pittsburg .....	46	3,800
Bridgeport to Decatur .....	110	6,000
Hitch's Ferry, Ala., to Lock B .....	104	4,000
Langston, Ala., to Decatur .....	74	4,789
Chattanooga to Bridgeport .....	50	752
Henrys Island, Alabama, to Guntersville .....	3.5	6
<b>Lumber:</b>		
Lamb's Ferry, Ala., to Florence .....	24	40
Decatur to Florence .....	48	120
Total .....		19,507

In detail the flatboat traffic for 1902 was as follows:

	Miles.	Tons.
Chattanooga to South Pittsburg (sand) .....	46	3,980
Bridgeport to Lamb's Ferry (logs and lumber) .....	133.5	7,000
Raccoon Creek to Bridgeport (logs and lumber) .....	18	3,400
Total .....		14,380

# 1602 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

Details of the entire traffic for 1902 are shown in the following table:

Between what points.	Miles.	Passen- gers.	Tons.
Chattanooga and Paducah <sup>a</sup>	464	600	2,806
Chattanooga and Florence <sup>a</sup>	207	7,054	28,785
Chattanooga and Lambs Ferry	183	2,548	15,796
Bridgeport and Lock 1	137		5,000
Bridgeport and Lambs Ferry	133.5		7,000
Bridgeport and Decatur	110		6,000
Hitch's Ferry and Lock B	104		4,000
Decatur and Hamburg	103	150	3,612
Guntersville and Lock 6	92	150	3,150
Kellys Ferry and Guntersville	84		2,779
Langston and Decatur	74		4,789
Decatur and Florence	48		120
Chattanooga and Bridgeport	50		752
Chattanooga and South Pittsburg	46		7,700
Lambs Ferry and Florence	24		40
Hobbs Island and Guntersville	22	7,635	42,086
Raccoon Creek and Bridgeport	18		3,400
Henrys Island and Guntersville	3.5		6
Total		18,139	137,861

<sup>a</sup>Traffic by river between these points was suspended, Mar. 29 to June 4, both inclusive, on account of damage to canal aqueduct by storm.

Of the 14 steamboats reported in the last annual report as plying on the Tennessee River between Chattanooga, Tenn., and Florence, Ala., 7, having a total of 496 tons, were not in this service during the year, but the number of barges was increased from 44 to 46.

Five additional boats were put on, as follows:

Names of steamboats.	Length.	Width.	Depth.	Net ton- nage.	Height of pilot house.	Height of smoke- stack.	Num- ber of barges.	Capac- ity of barges.
	<i>Feet.</i>	<i>Feet.</i>	<i>Feet.</i>		<i>Feet.</i>	<i>Feet.</i>		<i>Tons.</i>
American	158	27.6	4.2	190	48	57	18	4,500
J. T. Reeder	100	24	3.5	60	27	38	1	70
J. R. Gunn	60	16	2.5	43	15.5	21.75	3	200
Joe Wheeler	155.8	33.5	3.5	192	35	45	1	125
Isabella King	134.8	22.5	3.2	89	23	28	1	300

The total number of craft operating in this section of the river during the year ending December 31, 1902, was 12 steamboats of a total of 1,431 tons burden net and 46 barges of a total capacity of 8,810 tons, as shown by the list herewith.

The steamboats *Avalon* and *J. T. Reeder* are also reported as plying on the Tennessee River between Florence, Ala., and Paducah, Ky., and the steamboats *Isabella King* and *Gasconade* on the Tennessee River above Chattanooga, Tenn.

List of boats and barges navigating the Tennessee River between Chattanooga, Tenn., and Florence, Ala., during the year 1902.

Names.	Tonnage.	Barges.		Between what points.	Miles.
		Number.	Tonnage.		
<i>Avalon</i>	362	1	200	Chattanooga and Paducah	464
<i>American</i>	190	18	4,500	Chattanooga and Florence	206
<i>Decatur No. 1</i>	48	5	300		
<i>Sam Davis</i>	93	2	250		
<i>Gasconade</i>	74	2	250	Chattanooga and Lambs Ferry	183
<i>Joe Wheeler</i>	192	1	125		
<i>Isabella King</i>	89	1	300	Bridgeport and Lock 1	137
<i>J. T. Reeder</i>	60	1	70	Decatur and Hamburg	103
<i>J. R. Gunn</i>	43	3	200	Guntersville and Lock 6	92
<i>City of Charleston</i>	92	2	380	Kellys Ferry and Guntersville	84
<i>Huntsville</i>	89	1	120		
<i>Hattie McDaniels</i>	99	1	160	Hobbs Island and Guntersville	22
<i>Joe Wheeler</i> <sup>b</sup>					
<i>Sam Davis</i> <sup>b</sup>					
Barge		1	1,000	Bridgeport and Lambs Ferry	133.5
Barge		1	200	Chattanooga and South Pittsburg	46
Barges		6	255	Raccoon Creek and Bridgeport	18
Total	1,431	46	8,810		

<sup>a</sup> Operated by railroad company.

<sup>b</sup> Operated by railroad company during low-water season.

*Tennessee River, between Florence, Ala., and Paducah, Ky.*

Articles.	Year ending Dec. 31, 1902.	
	Tons.	Estimated value.
Brick .....	495	\$2,160
Coal <sup>a</sup> .....	280,535	490,938
Cotton .....	4,222	759,915
Cotton seed .....	2,487	52,222
Fertilizer .....	6,755	135,100
Flour .....	14,721	662,422
General merchandise .....	75,908	8,998,558
Grain .....	10,593	276,673
Hay .....	1,606	32,125
Hoop poles .....	900	2,400
Live stock .....	3,709	593,440
Logs .....	44,134	353,068
Lumber .....	85,870	448,192
Marble .....	524	57,902
Peanuts .....	6,717	816,040
Railroad ties .....	533,266	1,279,836
Sand <sup>a</sup> .....	15,000	10,500
Staves .....	14,050	168,600
Stone .....	483	53,371
Tan bark .....	205	2,844
Tobacco .....	695	166,800
Telegraph poles .....	1,000	5,000
Wood .....	3,000	4,500
Totals .....	1,056,270	15,370,604

<sup>a</sup> Moved only in Paducah harbor (except 535 tons of coal). Number of passengers transported (1902), 20,378.

Of the logs, 27,324 tons were moved in rafts. Details are shown in the following table:

	Miles.	Tons.
Florence, Ala., to Paducah, Ky. ....	256.9	17,600
Waterloo, Ala., to Paducah, Ky. ....	226.5	200
Riverton, Ala., to Paducah, Ky. ....	226	1,600
Savannah, Tenn., to Paducah, Ky. ....	189	1,000
Wells Point, Tenn., to Paducah, Ky. ....	176	874
Perryville, Tenn., to Paducah, Ky. ....	134	3,000
Cuba Landing, Tenn., to Paducah, Ky. ....	114.5	2,000
Danville, Tenn., to Paducah, Ky. ....	78.3	1,050
Total .....		27,324

Details of the entire traffic for 1902 are shown in the following table:

Between what points.	Miles.	Passen- gers.	Tons.
Chattanooga and Paducah .....	464	600	2,806
Florence and Paducah .....	256.9	18,873	474,701
Brush Creek Island and Paducah .....	231.5		64,785
Waterloo and Paducah .....	226.5		148,514
Riverton and Paducah .....	226		1,600
Hamburg and Paducah .....	201.5		5,097
Shiloh and Paducah .....	197.5		908
Savannah and Paducah .....	189		1,000
Wells Point and Paducah .....	176		874
Clifton and Paducah .....	158	755	10,049
Cedar Creek Landing and Paducah .....	141.3		2,000
Perryville and Paducah .....	134		3,500
Dennisons Landing and Paducah .....	123.4		6,000
Cuba Landing and Paducah .....	114.5		2,000
Decatur and Hamburg .....	103	150	3,612
Danville and Paducah .....	78.3		20,546
Hurricane Island and Paducah .....	76		3,130
Pine Bluff and Paducah .....	50		7,000
Aurora and Paducah .....	41.5		3,128
Blounts Landing to below Perryville .....	2.5		20
Towed in the harbor at Paducah .....	2		295,000
Total .....		20,378	1,056,270

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Of the 37 steamboats reported in the last annual report as plying on this section of the river, 15, of a total of 2,139 tons, were not in this service during the year, and the number of barges was reduced from 298 to 193.

Ten additional boats were put on, as follows:

Names of steamboats.	Length.	Width.	Depth.	Net tonnage.	Height of pilot house.	Height of smoke-stack.	Number of barges.	Capacity of barges.
	<i>Feet.</i>	<i>Feet.</i>	<i>Feet.</i>		<i>Feet.</i>	<i>Feet.</i>		<i>Tons.</i>
City of Savannah				293	48	65		
J. T. Duffy, Jr				146	24	34	10	5,810
J. T. Reeder	100	24	3.5	60	27	33	1	70
John S. Summers	108.2	21.3	3.4	66	24	30	8	4,051
Key City	80	15	3.1	59	27	38	3	225
Kuttawa	58	10	2.5	12	18	19	2	200
Monie Bauer	73	17.5	3	49	28	38	5	1,100
Marie J.	100	20	4.4	76	29	35.5	10	1,250
Shiloh				150	37	53	1	300
Maud Kilgore	115	23	3.5	92	30	35	5	1,750

The total number of craft operating in this section of the river during the year ending December 31, 1902, was 32 steamboats, of a total of 4,223 tons burden, net, and 193 barges, of a total capacity of 75,012 tons, as shown on list below. Two steamboats, the *Avalon* and *J. T. Reeder*, a total of 422 tons burden, and 2 barges, total capacity 270 tons, are also reported as plying on the Tennessee River between Chattanooga, Tenn., and Florence, Ala.

*List of boats and barges navigating the Tennessee River between Florence, Ala., and Paducah, Ky., during the year 1902.*

Names.	Tonnage.	Barges.		Between what points.	Miles.
		Number.	Tonnage.		
Avalon	302	1	200	Chattanooga and Paducah	464
Inverness	121				
J. T. Duffy, Jr	146	45	26,156		
Pavonia	132				
Russell Lord	186				
Dick Clyde	80	6	2,500		
City of Savannah	293				
City of Memphis	322			Florence and Paducah	256.9
City of Clifton	295	3	900		
Clyde	335				
Shiloh	150				
Tennessee	248				
Ten Broeck	148	11	4,350		
J. M. Howell	94	17	9,942		
Penguin	76	9	2,700	Brush Creek, Ala., and Paducah	231.5
Victor	100	9	5,130		
Lyda	92	9	4,500		
I. N. Hook	55				
Wilford	47	13	2,810	Waterloo, Ala., and Paducah	226.5
Thomas Parker	57	6	2,875		
J. M. Richtman	132	8	800	Hamburg, Tenn., and Paducah	201.5
Charleston	94				
L. H. Buhrman	96	7	1,400	Clifton, Tenn., and Paducah	158
Wabash	122	2	900	Cedar Creek Landing, Tenn., and Paducah	141.3
Key City	59	3	225	Perryville, Tenn., and Paducah	134
Monie Bauer	49	5	1,100	Dennisons Landing, Tenn., and Paducah	123.4
J. T. Reeder	60	1	70	Decatur and Hamburg	108
Mary N	36	12	1,200		
John S. Summers	66	8	4,051	Danville, Tenn., and Paducah	73.3
Maud Kilgore	92	5	1,750		
Kuttawa	12	2	200	Hurricane Island, Tenn., and Paducah	76
Marie J.	76	10	1,250	Pine Bluff, Ky., and Paducah	50
Barge		1	3	Aurora, Ky., and Paducah	41.5
				Blounts Landing to below Perryville, Tenn.	2.6
Total	4,223	193	75,012		



## E E 2.

## OPERATING AND CARE OF MUSCLE SHOALS CANAL, TENNESSEE RIVER.

During the year minor repairs were made to the locks, gates, and operating machinery; the embankments were maintained in good condition; the lateral dam above Lock A was repaired in several places where it had been damaged by the high waters of previous years.

Only a comparatively small amount of dredging was done, owing to the necessity for putting the dredge out of commission for rebuilding. A large amount of dredging is required as soon as the dredge is rebuilt.

Extensive repairs to the telephone lines, amounting almost to rebuilding, were made. The lines have been doubled, giving a complete metallic circuit, and new instruments of the long-distance type installed.

Considerable work has been done on the railroad. The old ballast, which was too large to tamp well, was removed from about  $4\frac{1}{2}$  miles of track from the upper end to Lock 3 and for one-half mile between Lock 6 and the aqueduct and replaced with new gravel ballast dredged from Bluewater and Second creeks. Necessary repairs to the rolling stock to maintain it in good condition have been made.

More work than during any previous year was done at the sawmill. Timber has been purchased in the neighborhood, cut, hauled, and sawed, at a total cost of \$10.85 per M. The same lumber bought in the market would have cost \$25.

An allotment of \$8,000 was obtained for rebuilding the dredge *Bucyrus*, which was built in 1891 and had been in use on the canal since that date. The hull and cabin have been rebuilt, and the machinery transferred from the old hull to the new. Work can be completed within three weeks after the receipt of certain parts of the machinery which were ordered from the Bucyrus Company in February, but have not yet been received. The balance remaining from this allotment is \$2,423.80. The rest of the floating plant has received the necessary repairs.

The total amount expended for operating and care of the Muscle Shoals Canal during the fiscal year ending June 30, 1903, of the allotment for that year, was \$61,212.78.

The work of repairing the damage done by the storm of March 28, 1902, was completed during the year, and the remaining balance of \$12,950.16 of the special allotment of \$30,000 all expended. The chief items covered by this work were repairs to and paving the embankments and rebuilding railroad track. The greatest damage was done to the embankment below Lock 7, where a portion of the retaining wall and bank of the canal had been washed away. About one-half mile of the railroad track in this section had also been swept off the embankment, nearly all the ties lost, and many of the rails rendered unfit for further use. The Shoal Creek bridge had been washed away and had to be rebuilt. For detailed statement of the work done to repair these damages, as well as for a statement of the work of operating and care during the year, attention is invited to the accompanying report of Mr. W. S. Winn, assistant engineer in charge of the canal.

A special allotment of \$1,200 was made for the purchase of a tract of land lying between the northerly embankment of the old canal location and the southerly embankment of the present canal; this last

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embankment being taken as 50 feet wide, measured parallel to and to the south of the normal southerly boundary of the water surface of the present canal.

This purchase was made as a compromise with the owner of the land, Mr. Emmet O'Neal, of a suit brought by him against the United States for possession and damages, and in compliance with an offer from him to convey to the United States all the lands embraced in the pending suit, releasing all claims for detention of same and for damages to adjacent lands, for the sum of \$1,000. The deed transferring the property to the United States was executed October 2, 1902, and recorded in the probate court of Lauderdale County, Ala., volume 63, page 333, of the court records. Recording deed cost \$4, leaving an unexpended balance of the allotment of \$196.

## ABSTRACT OF ALLOTMENTS.

November 28, 1890 .....	\$40,000.00
July 1, 1891 .....	31,792.04
July 1, 1892 .....	45,232.90
July 1, 1893 .....	60,975.19
July 1, 1894 .....	63,772.63
July 1, 1895 .....	64,793.11
July 1, 1896 .....	62,707.46
July 1, 1897 .....	67,979.55
July 1, 1898 .....	62,868.17
July 1, 1899 .....	59,239.20
July 1, 1900 .....	63,000.00
July 20, 1900, to cover deficiency .....	355.95
November 2, 1900, to repair dam above Lock A .....	4,500.00
July 1, 1901 .....	62,990.65
April 12, 1902, to repair storm damage .....	30,000.00
July 1, 1902 .....	60,529.19
August 7, 1902, to rebuild hull of dredge .....	8,000.00
November 6, 1902, to purchase land .....	1,200.00
Total .....	789,876.04

*Estimate of funds needed from appropriation for operating and care of canals and other works of navigation (indefinite), to be applied to current expenses in operating the Muscle Shoals Canal from July 1, 1903, to June 30, 1904.*

Amount required for fiscal year ending June 30, 1904 .....	\$62,000.00
Balance remaining from allotment of preceding year, including balance of allotment for purchase of land (\$196) .....	983.23
Additional allotment needed for fiscal year ending June 30, 1904 .....	61,016.78

*Summary of expenditures for operating and care of Muscle Shoals Canal for the fiscal year ending June 30, 1903.*

Office and administration .....	\$6,541.44
Operating and care of locks .....	6,750.39
Dredging, maintenance of embankment, etc .....	3,785.01
Buildings, grounds, etc., including machine shop, sawmill, and dry dock .....	6,767.23
Railway: Repair and operation .....	9,186.82
Towboat crews .....	4,050.73
Subsistence of employees .....	8,189.99
Supplies: Fuel, oil, rope, etc .....	5,100.00
Repair of dredge and plant, material, and contingencies .....	10,841.18
Total .....	61,212.78

*Money statement.*

July 1, 1902, balance unexpended.....	\$22, 171. 35
Allotments for fiscal year ending June 30, 1903 .....	69, 729. 19
	<hr/>
June 30, 1903, amount expended during fiscal year .....	91, 900. 54
	<hr/>
July 1, 1903, balance unexpended.....	6, 714. 02
July 1, 1903, outstanding liabilities .....	3, 307. 00
	<hr/>
July 1, 1903, balance available.....	3, 407. 02
The balance available is composed of three items:	
1. Balance of allotment for fiscal year ending June 30, 1903 .....	\$787. 22
2. Balance of allotment for purchase of O'Neal property .....	196. 00
3. Balance of allotment for rebuilding hull of dredge Bucyrus .....	2, 423. 80
	<hr/>
	3, 407. 02

There will be no further expenses connected with the purchase of the O'Neal property, and the balance of \$196 can be applied to operating and care of canal during fiscal year ending June 30, 1904.

## COMMERCIAL STATISTICS.

*Statement of traffic through the Muscle Shoals Canal during the calendar year ending December 31, 1902, compared with traffic during years ending December 31, 1899, 1900, and 1901.*

Craft, etc.	Year ending December 31—			
	1899.	1900.	1901.	1902.
Steamers.....number.....	218	409	295	173
Barges.....do.....	323	419	253	162
Rafts.....do.....	2	7	6	2
Miscellaneous craft.....do.....	12	12	18	18
Tonnage.....	46,546	68,679	73,702	a 28,530

Articles.	Year ending December 31—				Estimated value, 1902.
	1899.	1900.	1901.	1902.	
	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>	
Coal.....	306	212	25	60	\$150
Cotton.....	959	847	304	701	126, 180
Cotton seed.....	1, 710	804	945	1, 271	26, 691
Flour.....		5	20	1	40
General merchandise.....	1, 070	2, 594	4, 083	3, 140	302, 500
Grain.....	604	268	391	287	7, 175
Live stock.....	16	36	5	6	420
Logs.....	2, 865		60	48	384
Lumber.....	4, 222	7, 049	2, 616	326	4, 075
Produce.....				286	17, 100
Staves.....		1, 000	440	74	402
Spoke timber.....			2, 706		
Wood.....	2, 567	2, 066	320	1, 512	2, 238
Total.....	14, 319	14, 881	11, 925	7, 712	577, 505
Passengers.....number.....	5, 466	7, 962	8, 901	1, 370	

a The canal was closed to traffic from March 28 to June 5, 1902, while undergoing extensive repairs, made necessary by a severe storm which had carried away part of the aqueduct, parts of the embankment, and done much other damage.

Number of lockages (1902), 1,987.

The above is exclusive of supplies carried by Government steamers.

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REPORT OF MR. W. S. WINN, ASSISTANT ENGINEER.

UNITED STATES MUSCLE SHOALS CANAL,  
*Kingman, Ala., June 30, 1903.*

CAPTAIN: I have the honor to submit the following report of work done in connection with the operation and care of Muscle Shoals Canal for the fiscal year ending June 30, 1903:

The same classification of work that has been used for the past six years in the annual reports on this work will be adopted for this report, and is as follows:

*Canal.*—Operation and care of locks and similar structures, maintenance of embankment, and dredging and care of canal trunk.

*Railway.*—Maintenance of way; rolling stock, repairs, etc., and operating expenses.

*Telephone line.*—Operation and repairs.

*Machine and blacksmith shops and foundry.*—Operation and repairs.

*Sawmill and carpenter shops.*—Operation and repairs.

*Buildings.*—Improvements and repairs.

*Quarters and grounds.*—Care of, etc.

*Floating plant.*—Operation and repairs.

*Dry dock.*—Operation and repairs.

*Extraordinary expenses.*—Repairs due to storm damage.)

CANAL.

*Operation and care of locks, etc.*—All of the locks are operated by hand power except Lock A, which is worked by hydraulic machinery. This hydraulic machinery needs repair oftener than any other pieces of machinery on the canal. In seven of the past twelve months repairs on it were necessary, and the necessity for such repairs will become more frequent as the machinery gets older. All parts of it show to be the worse for wear. During very cold weather water freezes in the connecting pipes so often that it is generally found desirable to disconnect the pipes and operate the gates and valves by hand throughout the winter months. For that purpose, and in case of a break in the hydraulic machinery, it is necessary that crabs, in suitable frames, be kept at hand. Maneuvering with crabs is slow, hard work, and, besides, they are unsightly objects on the lock abutments. It has been proposed to do away with the hydraulic power during the next fiscal year and substitute the type of balance valves and hand-power maneuvering gearing in use at the other locks. That will be more satisfactory than the present method and will not complicate the matter of repairs by introducing new features, but, instead, will complete the uniformity of the prevailing type of valves and maneuvering appliances for gates and valves now in use. Plans for making the change and an estimate of its cost will be submitted for your approval immediately after the end of the fiscal year.

The gates at Locks A and B were scrubbed and painted. These gates were cleaned with the sand blast about eighteen months ago. A coat of red lead was put on immediately after cleaning, the second coat in about a month after and the third coat about seven months after the second. I believe it will be a long time before they need paint again. The gates on the lower division, which were cleaned and painted from one to two years before those at Locks A and B, are beginning to need paint badly again. I am informed that some of these gates were given only one coat of paint after cleaning, and where they got two coats the last was put on before the first had had time to season thoroughly. Most of these gates will have to be scrubbed and painted during the ensuing year.

The top halves of the miter posts of the lower gates at Lock A rotted away and had to be replaced. One valve each at Locks 3 and 8 twisted on its shaft and had to be repaired. The set screws with which the valves were originally fastened to their shafts were not of sufficient strength to keep the valves from turning on their shafts, and it has been necessary to replace nearly all of the set screws with steel pins of greater strength that pass through the shafts and hub of valve.

When the present valve frames were put in, recesses for them were roughly cut in the sides and top of the culverts and the frames placed in without mortar or other substance to fill in the cracks around them. The cracks have gradually worn larger until the leakage is noticeable in its effect on operating the gates. Advantage was taken of that part of the canal being drained last summer to remedy this trouble at Locks 7 and 8. They were filled in with rich Portland cement mortar. Those at the other locks will be treated in like manner as the opportunity offers or as necessity requires.

*Detailed statement of repairs on locks and similar structures.*

*Lock A.*—Repaired hydraulic machinery, valves, hand railing, spar platforms, and foot bridges; cleaned and painted gates; removed parts of lower miter posts and put in new pieces.

*Lock B.*—Painted gates.

*Lock 1.*—Rebuilt spar platforms and repaired foot bridges.

*Lock 2.*—Rebuilt spar platforms and repaired foot bridges.

*Lock 3.*—Repaired valves, spar platforms, and foot bridges.

*Lock 4.*—Painted snubbing posts, valve covers, anchor posts, etc.

*Lock 5.*—Painted snubbing posts, valve covers, anchor posts, etc.

*Lock 6.*—Painted snubbing posts, valve covers, anchor posts, etc.; repaired hand railing.

*Lock 7.*—Repaired hand railing on drop gate; filled in around valve frames; welded stem of valve; repaired spar and rollers on drop gate; painted snubbing posts, valve covers, anchor posts, etc.; repaired spar platforms.

*Lock 8.*—Filled in around valve frames; put pins in stem of valve; painted valve covers, snubbing, and anchor posts, etc.; repaired and painted the top of the north wall. This wall has an iron frame attached to the adjacent bluff and is faced with timber. The timber was renewed halfway down.

*Lock 9.*—Repaired hand railing on drop gate; substituted a new steel gauge three-eighths inch thick and 7 inches wide for the old wooden one; painted valve covers, snubbing, and anchor posts, etc.

*Aqueduct.*—Made scraping tools, and cleaned and covered with pitch the bottom beams; repaired side fenders.

*Drift sluice.*—Removed drift and stone from outlet.

*Second Creek Dam.*—Repaired valves.

*Bluewater Dam.*—Put in new valves at east end of the dam.

*Unit cost of operating and care of locks.*

Month.	Cost per lock.	Total cost.	Vessels through canal.	
			Number.	Cost per vessel.
1902-3.				
July .....	\$43.20	\$475.20	7	\$67.89
August .....	66.40	730.40	8	91.30
September .....	92.45	1,016.95	10	101.70
October .....	39.88	438.68	21	20.89
November .....	58.44	587.84	27	21.77
December .....	48.43	532.73	17	31.34
January .....	85.66	942.26	21	44.87
February .....	47.29	520.19	25	20.81
March .....	52.71	579.81	15	38.65
April .....	42.65	469.15	19	24.69
May .....	41.54	456.94	31	14.74
June .....	34.06	374.66	19	19.71
Average per month .....	53.98	593.78	18	32.38

Total number of lockages, including lockages for craft belonging to the United States, which are not included in the above table, 2,547.

*Maintenance of embankment.*—Eight leaks occurred in the embankments during the year, but were stopped before they had attained a dangerous size.

The high waters of the preceding year knocked off a number of the coping stones of the lateral dam above Lock A and in several places disturbed the underlying courses. All of the stones that could be economically recovered were put back and 25 cubic yards additional stone was quarried to fill the gaps. Every high-water season leaves hundreds of cords of drift on this dam for about a mile of its length. The drift was removed once during the year for that length and in places two or three times.

Other works comprised under this head were cutting weeds and grass, repairing slopes damaged by hard rains, and setting out Bermuda grass for the protection of slopes. It is the aim to add every year to the slopes protected by Bermuda grass and eventually have it from one end of the canal to the other. It is an ideal protection against gully washing from heavy rains, and also serves to choke out weeds. During the year about 1½ miles of the embankments have been set in Bermuda grass.

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*Dredging and care of canal trunk.*—The dredge, which is of the elevator type and was built in 1891, was in such bad shape that it was necessary to rebuild it; therefore only such repairs were made as were actually needed to carry the dredge through a short season. On account of having the crew at work repairing storm damage, dredging was not begun until the last of July and was abandoned late in October because the condition of the dredge was considered unsafe for the operatives. Dredging in the pool between Locks 1 and 2 was finished. After that the dredge was started for Lock 6, and on the way down dredged at the mouths of all the creeks and branches in sections 11, 12, 13, and 20. There is a year's work ahead of the dredge when it comes into service again. The following table gives the monthly work performed by the dredge, and its cost, which includes wages of operatives, running repairs, and materials expended:

*Statement of dredging.*

Month.	Classification.	Wages of operatives and material expended.	Cost of repairs.	Cubic yards dredged.	Cost per cubic yard.
1902.					
July.....	Mud and gravel.....	\$245.31	\$34.50	11,440	\$0.024
August.....	do.....	374.34	6.25	12,825	.029
September.....	do.....	363.65	31.75	11,125	.035
October.....	do.....	46.28		2,733	.017
Total.....		1,029.58	72.50	38,123	.029

Dredge undergoing repairs from October, 1902, to July, 1903.

*Unit cost of maintenance of canal trunk and embankment.*

Month.	Cost per mile of canal. <sup>a</sup>	Vessels through canal.	
		Number.	Cost per vessel.
1902-3.			
July.....	\$23.47	7	\$30.35
August.....	30.43	8	38.49
September.....	30.88	10	55.58
October.....	20.69	21	17.73
November.....	36.57	27	24.34
December.....	15.02	17	15.90
January.....	8.16	21	6.99
February.....	9.80	25	6.69
March.....	7.16	15	8.59
April.....	4.66	19	4.41
May.....	2.88	31	1.67
June.....	12.10	19	11.47
Average.....	17.30	18	17.30

<sup>a</sup>Length of canal trunk, 18 miles.

## RAILWAY.

*Maintenance of way.*—It has been the aim not only to do the ordinary work incident to keeping up the 16½ miles of track and sidings, but to improve the condition of part of the roadbed every year. Over half of the rails were in use during construction of the canal before much attention was paid to tamping up joints or to alignment. They are badly kinked and can never be brought to the smooth surface of a first-class road. At places the rails have been bent sideways by boats snubbing to the track during a storm in order to keep off the bluffs on the opposite side of the canal. When locomotives tow barges through the canal there is an unusual tendency to displace the track, and to provide against it the ties should be well filled. Heretofore the spaces between the ties were only about half filled. The ballast was too large—some of it being too large to drop through an 8-inch ring—to permit of its being tamped under the ties. This caused a great many low joints in the track. Authority was obtained to use, during the month of January, the dredge *Kentucky*, which was in winter quarters here at that time, for the

purpose of dredging gravel from Bluewater and Second creeks to ballast a part of the track. The worst part of the track, from the head of the canal to Lock 3, 4½ miles long, was selected to begin on. The old ballast of clay and broken stone was removed, the clay being used to strengthen the embankment in narrow places and the stone for riprap for the canal side of the embankment at places where the waves from steamboat wheels had eroded it.

The gravel has a little sand in it, and ranges from that size to pieces that would just pass a 2½-inch ring. It makes an ideal ballast for keeping the track to grade, and enough was put in to hold the track in place against the strain of locomotives towing barges. Another point in its favor is that grass and weeds do not grow as rank in it as in the old ballast, and what does grow can be more easily removed. I believe the initial cost of putting in the gravel ballast will be saved in three years by the saving in cost of keeping the track surfaced and lined, and in keeping the roadbed weeded and grassed.

A half mile of the track between Lock 6 and the aqueduct was also graveled. In the whole work 3,585 cubic yards of gravel was used. The 5 miles rebalasted cost for removing the old ballast and ties and putting in the new ballast and 1,507 new ties, for labor \$1,628.87, and for ties and other material used \$425, a total of \$2,053.87, or about \$411 a mile. Afterwards a section gang went over the whole distance to smooth over the surface, retamp the ties, and clean up the old ties and ballast. The cost of this work was \$104 a mile, making the total cost per mile \$515.

During the year 6,709 ties were renewed. Of that number 2,859 were used in the track and 665 used on the Shoal Creek bridge, repairing storm damage.

*Unit cost of operation and maintenance of railway.*

Month.	Cost per mile for maintenance of tracks. <sup>a</sup>	Miles run by engines.	Cost per engine-mile. <sup>b</sup>
1902-3.			
July.....	\$29.84	2,672	\$0.085
August.....	31.73	2,488	.072
September.....	31.26	2,334	.063
October.....	66.05	3,002	.073
November.....	19.68	1,881	.062
December.....	6.55	1,582	.073
January.....	125.35	1,694	.083
February.....	17.27	1,750	.114
March.....	25.35	1,684	.090
April.....	14.97	1,554	.095
May.....	41.81	1,381	.124
June.....	28.13	1,784	.062
Average per month.....	34.84	1,981	.083

<sup>a</sup>Length of track and sidings, 16 miles.

<sup>b</sup>For operating expenses.

*Rolling stock.*—The rolling stock consists of 7 flat cars, 2 locomotives, 2 hand cars, 2 velocipedes, 1 laborers' coach, 1 inspection car, 1 open car, and 2 trucks. All of the rolling stock had some repairs during the year. The flat cars were constantly in need of repairs, on account of the extraordinary work placed on them in transporting men and materials to repair storm damage. The laborers' coach was painted and its roof repaired. The open car was overhauled and painted. Locomotive No. 5 had new flues put in and a number of minor repairs made. Locomotive No. 4 was thoroughly overhauled and painted, new flues put in, new cowcatcher put on, new smokestack—in fact everything done to put it in first-class shape.

TELEPHONE LINE.

The service on the telephone lines owned by the United States had become so poor that extensive improvements were undertaken during the year. There are two distinct lines, one from Lock 6 to Florence, connecting with the lines of the Southern Bell Telephone Company at Sweetwater Creek in the latter place, and by that means with the company's central office in Florence; the other runs from Lock 9 to Lock A, and has an instrument in the lockman's house at every lock. The former goes on to Center Star, Ala., about 7 miles beyond Lock 6, by way of Lock 5. That part of the line was formerly owned by private parties. The wires, however, were strung on the Government poles from Lock 6 to Lock 5.

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When the improvement was made, the private wire was removed and wires belonging to the Government were put up, making an addition of  $4\frac{1}{2}$  miles to the lines owned by the Government, and giving a total of 38 miles. The lines were formerly a single wire, and the instruments were of the old Berliner-Blake type and had been in use about as long as is considered to be the life of those instruments. The lines have been doubled, giving a metallic circuit, and new instruments of the long-distance type have been put in. The lines were in such bad shape that the work undertaken meant practically rebuilding them.

A great source of annoyance in maintaining the lines is the falling of trees and limbs across them. For about half their length they pass through heavily timbered country, and after every storm there is trouble.

Another source of trouble is the long spans from one tow-head to another in the crossing of the river at Lock 1. The wire sags so low in the middle of the long spans that drift borne on high waters often breaks it. High winds and cold weather often snap it, too. It is proposed to build timber cribs in the middle of the long spans, fill them with stone, and plant high poles in the cribs and on the tow-heads to get the wires higher above the water and reduce the length of the spans. Chestnut poles for that purpose are on hand, and the cribs will be put in at an early date.

## Cost of operation, maintenance, and improvement of telephone lines.

Month.	Length of line.	Cost of labor.	Cost of materials.	Cost per mile.	Remarks.
1902-3.	Miles.				
July.....	33.5	\$324.04	\$105.13	\$12.81	Doubled canal line and put in new instruments.
August.....	33.5	99.25	123.94	6.66	
September.....	33.5	15.00		.45	
October.....	33.5	14.90	23.65	1.15	
November.....	33.5	153.96	104.10	7.70	Doubled Florence line.
December.....	33.5	16.27		.49	
January.....	33.5	39.35	9.99	1.44	
February.....	33.5	31.22		.93	
March.....	33.5	17.42		.46	
April.....	38	138.36	74.00	5.53	Extended line to Lock 5.
May.....	38	3.00		.08	
June.....	38	3.15		.09	
Average per month.....		71.24	36.73	3.12	

## MACHINE AND BLACKSMITH SHOPS AND FOUNDRY.

*Operation and repairs.*—New smokestack and skylights were put in the machine shop. Pump, engine, and tools were repaired. The foundry was painted. Castings aggregating in weight 18,670 pounds, and weighing from 1 to 500 pounds each, have been made during the year, and cost about 1.65 cents a pound for labor and material.

## SAWMILL AND CARPENTER SHOPS.

*Operation and repairs.*—More work has been done in the sawmill this year than during any previous year of its existence. There was more extraordinary work to be done that required lumber, and the supply of available logs was greater. Lumber was needed to repair storm damage, the lower river dredging fleet, and other floating plant and structures on the canal, such as timber wall at Lock 8, spar platforms and footbridges at the various locks, and for repairs to buildings, etc.

The best white-oak and ash logs were secured on Stubbs Island, just opposite the head of the canal. While the cost on the stump was rather large—\$5 a thousand feet B. M.—the timber was so convenient to the river and the cost of hauling so small that the final cost of the lumber secured was light. One four-mule team and wagon hauled 79,707 feet B. M. in fourteen days, at a cost for cutting and hauling of \$153.72, or \$1.93 a thousand. The total feet B. M. of logs bought during the year was 171,496. The average cost, delivered at the mill, was \$7.84 a thousand. Add to that the average cost of sawing for the year, \$3.01 a thousand, and it makes the lumber sawed from these logs cost \$10.85 a thousand. The same



class of lumber bought in the market would have cost, delivered here, not less than \$25 a thousand. There are still on hand 23,958 feet B. M. of the logs to be sawed later into special sizes as needed for repairs. There are also 26,800 feet B. M. of standard sizes of lumber on the yards seasoning.

No repairs of an unusual nature were made.

*Amount and cost of lumber sawed and planed.*

Month.	Sawed.		Planed.	
	Feet B. M.	Cost per thousand.	Feet B. M.	Cost per thousand.
1902-3.				
July .....	25,082	\$3.16	12,159	\$1.15
August .....	9,882	3.24	11,734	1.89
September .....	5,929	3.11	6,880	2.29
October .....	4,133	3.74	4,394	3.05
November .....	30,987	2.93	6,510	1.87
December .....	33,212	2.70	16,565	1.45
January .....	16,673	2.60	39,273	.81
February .....	21,990	3.77	12,000	2.20
March .....	7,687	3.09	3,505	3.93
April .....	9,261	2.15	7,600	1.36
May .....	3,779	1.80		
June .....			1,100	2.13
Total and average .....	168,025	3.01	121,670	2.02

BUILDINGS.

*Improvements and repairs.*—The following buildings were painted: Property house, car shed, cow stable, locomotive shed, oil house, storage house, foundry, lockmen's houses at Locks A and B, lockmasters' houses at Locks A and B, lockman's house at Lock 9, and part of the one at Lock 8, tool house, property house, blacksmith shop, engine house, kitchen and outhouse at Lock A, dining rooms and kitchen in foreman's quarters, interior of kitchen at Lock 9, porch floors and six rooms in assistant engineer's quarters.

A room was ceiled in the barn and a flue put in it for quarters for the drivers; the kitchen and servant's room at the lockmaster's house were enlarged and repaired, and the kitchen of the lockman's house rebuilt; outside blinds were put on the lockman's house at Lock A; lockman's house at Lock 3 was raised, a stone foundation put under it, and the rooms of the basement ceiled. Two new hearths and a floor in one room were put in the assistant engineer's quarters. A small house, formerly used as a skiff house, was moved next to the negro quarters and fixed for quarters for cooks and waiters. A number of other repairs of an insignificant nature were made, but no new buildings were added, except three small chicken houses, one each for the use of the lockmen at Locks 3 and 5, and one for the occupant of the lockmaster's house at Lock 5.

*Unit cost of repairs and improvements of buildings.*

Month.	Cost per building.	Month.	Cost per building.
1902-3.		1903.	
July .....	\$3.45	February .....	\$1.67
August .....	2.58	March .....	4.60
September .....	1.74	April .....	2.03
October .....	8.21	May .....	.44
November .....	7.70	June .....	.27
December .....	6.13		
January .....	3.78	Total cost per building <sup>a</sup> .....	42.60

<sup>a</sup>Thirty-nine buildings.

QUARTERS AND GROUNDS.

Between the canal and the river and adjacent to Locks A and B, the United States owns about 10 acres of woodland that had grown up in briars and other

undergrowth. These lands were cleared of everything except the best trees, and the land drained. The embankment between Locks A and B was also cleared of a several years' growth of saplings, vines, etc.

About 500 linear feet of fence at Lock A, the same amount at Lock 4, and the fence around headquarters property at Lock 6 were rebuilt. The fence around headquarters was given a priming coat of paint. Dry dock fence and those at Locks A and 4 were whitewashed.

Seven linear feet of curbing was placed along the drives in the grounds at Lock 6 and 265 cubic yards of chert was put on the drives in the grounds and on the road from Lock 6 to the Huntsville road. Weeds and grass were kept cut from all the United States grounds. The lots in front of the lock masters' houses at Locks 2 and 3 were plowed, harrowed, and planted with Bermuda grass.

#### FLOATING PLANT.

*Repairs—U. S. S. Colbert.*—The boat was docked, 6 bottom planks renewed, rudders repaired, roof repaired, hull calked, 7 new stanchions and fenders put in, wheel repaired, hull and cabin painted, and numerous little repairs made to machinery and woodwork. A noiseless one-pipe steam heating system was put in, radiators being placed in Engineer officers' dining room, cabins, and bathroom. The pipes were covered with magnesite pipe covering. The total cost of repairs, including wages of those of the crew who were engaged in caring for the boat when not in use, was \$1,526.07.

*U. S. S. Kingman (including cost of operation).*—The *Kingman* does most of the boating work for the canal, such as bringing supplies from Florence, carrying materials to the upper division, handling barges in the canal, bringing coal and lumber from Decatur, and for use as an inspection boat. It was docked, hull scraped and repaired, new sprocket wheels made and put on, new smokestack put on, and new set of flues put in boiler. It was kept painted from bottom to top. Many other small repairs were made by the crew when the boat was not running. The total cost for operation, care of, and repairs was \$1,720.32.

*Dredge Bucyrus (elevator).*—Only a few small repairs were made until after the dredge was put out of commission to be rebuilt. Early in July a report showing the necessity of rebuilding the dredge, together with an estimate of the cost of the same, was submitted. A special allotment of \$8,000 was set aside for the purpose. Bids for the lumber and other material needed were accepted in September, but it was not until after January 1, 1903, that sufficient material had been secured to make a start. The hull and cabin have been built and painted and the machinery transferred from the old hull to the new. All that it lacks of completion is the necessary time to install, when they arrive, some parts of the machinery to be furnished by the Bucyrus Company. It will take three weeks to put the dredge in commission after the arrival of these parts. They were ordered early in February. The company claims that the delay is caused by its inability to get steel castings from the East promptly. The job is first class throughout, both in workmanship and material. Most of the lumber is strictly all-heart, long-leaved yellow pine from southern Georgia, and was inspected at the mills. The repairs will be completed within the estimate and allotment.

*Derrick boat No. 3.*—Repaired roof and machinery and calked rakes and dry seams on the sides. Cost, \$72.68.

*Barge No. 12.*—Raised roof, repaired deck and rakes, and painted. Cost, \$16.94.

*Quarter boat No. 2.*—Tarred roof. Cost, \$3.

*Barge No. 13.*—Docked, put on new rakes, calked, patched gunwales and deck, put in new head blocks and check post, and put on stem and corner bands and painted. Cost, \$487.86.

*Barge No. 5.*—Docked, renewed bottom plank, calked rakes and sides, and painted. Cost, \$135.17.

*Naphtha launch No. 1.*—Docked, repaired machinery, and painted. Cost, \$39.91.

*Ponton barge.*—This barge is used by pedestrians, live stock, and vehicles crossing the canal at Lock 6. It was docked, scraped, and painted, and had its hull and deck repaired. Cost, \$42.29.

*Miscellaneous.*—Numbered floating plant and repaired three skiffs. Cost, \$37.75.

#### DRY DOCK.

*Operation and repairs.*—The following boats belonging to the United States were in the dock for repairs during the year: Dredge *Kentucky*, 3 dump scows, steamer *Lookout*, 4 barges, 1 quarter boat, steamer *Colbert*, steamer *Kingman*, naphtha launch No. 1, ponton barge, steamer *McPherson*, and dredge *Bucyrus*. No repairs were made on the dock.

## STORM DAMAGE.

The work of repairing damage due to a cloudburst that occurred March 28, 1902, over the drainage basins of the creeks that cross the canal was continued. The special allotment for that purpose, of which a balance of \$12,950.16 was left over from last year, was exhausted in December. By that time all the work outlined had been completed, except the paving on the canal side of the short embankment above the aqueduct on the north side of canal and putting additional anchor bolts in the repaired piers of the aqueduct. As these two pieces of work were designed for the purpose of giving greater strength than existed in those structures before the storm, and as they had already been put in better condition than formerly, it was considered that the work for which the allotment was made had been finished.

*Aqueduct.*—The only work done toward repairing the aqueduct of damage due to storm was putting on extra U-bolts, attaching to the top I-beam and passing around the upstream side of the repaired piers, and repairing fenders. The bottom I-beams were covered with gas-house pitch, but as the necessity for this was only partly due to storm, and as the cost of the pitch had already been charged to storm damage, the labor of putting on the pitch was charged to operating and care funds. Logs and stumps that had been sawed up and left on the upper side of the aqueduct were picked up with the derrick boat and transferred to the lower side, whence they would be carried away by the first big rise in Shoal Creek.

## EMBANKMENTS.

*Above aqueduct, north side.*—The retaining wall on the Shoal Creek side was rebuilt and 300 cubic yards of earth placed on the embankment to widen and raise it. The embankment had been rebuilt during the preceding fiscal year, but had settled so after water was turned on it that the above quantity of earth was needed to make it safe.

*Levee opposite Lock 7.*—The levee proper was paved during the previous year, but it was necessary to pave the adjacent embankment above and below the canal end of the levee.

*Below Lock 7.*—It was here that the greatest damage to embankment was done. From a point about 1,000 feet below Lock 7 to Lock 8 the river side of the embankment is faced with a dry-laid retaining wall, the river face of which is protected with heavy riprap to within 4 feet of its top. The upper 110 feet of this wall was carried away with the embankment back of it. The break there was caused by the scour due to the current of the water that passed into the canal out of Shoal Creek through the break back of Lock 7. After the canal leaves Lock 7 it makes a short curve and soon passes out of sight behind rock bluffs. Comparatively little damage was done to that part of the embankment that was behind the bluff and out of line of the current from Shoal Creek, though the pour over that part of the embankment was sufficient to sweep off the railroad track. The dry wall and riprap proved to be all right for use as a waste weir. It was decided to rebuild the retaining wall and to pave the canal face of the embankment where it showed scour. Six hundred and fifty linear feet of the canal face was paved with carefully laid paving blocks 18 inches deep. The paving was laid from the bottom of the canal trunk up to the ends and flush with the top of the ties. The railroad curve at this place was formerly a 19° curve. When it was rebuilt it was put in as a compound curve, the greatest degree of curvature of which is 12°. This was done without narrowing the canal.

*Miscellaneous places.*—Washed places in the embankment in sections 4, 9, 10, 11, 17, and 19 and back of Lock 3 were graded and set in Bermuda grass. It required the use of 3,880 cubic yards of earth, which was taken from a borrow bank below Lock 5 and transported in cars, except that used at Lock 3, which was taken from the north side of the canal near Second Creek and transported on barges. About half was taken from each place. The barge haul was about 24 miles; the train haul averaged 6 miles.

*Railway repairs.*—The track from the upper end of the break below Lock 7 to Lock 8, about one-half mile, was swept off the embankment. Nearly all of the ties were lost and many of the rails were rendered unfit for further use. In nearly every level of the canal some damage was done to the railroad track. Shoal Creek bridge was carried away. The ties and guard rails were lost, but the I-beams had been recovered during the preceding year. The bridge was rebuilt. Wherever damaged, the track was put back in good line and ballasted with gravel. The repairs necessitated the renewal of 3,524 cross-ties and about 1,700 linear feet of guard rail.

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The following is a summary of the classes and cost of work done in repairing storm damage:

Aqueduct .....	\$75.40
Embankments:	
Above aqueduct, north side—	
300 cubic yards of earth transported and tamped into embankment .....	82.70
120 cubic yards of stone quarried and built into retaining wall .....	291.08
Levee and adjacent embankment at Lock 7—	
Quarried 166 cubic yards of stone, graded embankment, and laid 332 square yards of paving .....	649.06
Below Lock 7—	
Excavated foundation, quarried stone for and built 463 cubic yards of dry wall .....	1,323.93
Paving, quarried 758 cubic yards of stone, and laid 1,517 square yards of paving 18 inches deep .....	3,367.72
Repairing embankment, 1,590 cubic yards of earth .....	284.08
Riprap, 108 cubic yards .....	69.86
Miscellaneous places—	
3,840 cubic yards of earth hauled, embankments graded and set in grass at Lock 3 and sections 9, 10, 11, 17, 27, and 4 .....	1,688.96
Railway:	
Repairs .....	1,648.42
Operation .....	390.79
Local office administration .....	240.50
Holidays and lost time .....	347.48
Subsistence .....	1,730.19
Miscellaneous .....	760.00
 Total .....	 12,950.16

Respectfully submitted.

W. S. WINN, *Assistant Engineer.*

Capt. W. J. BARDEN,  
*Corps of Engineers.*

## E E 3.

### IMPROVEMENT OF FRENCH BROAD AND LITTLE PIGEON RIVERS, TENNESSEE.

For description of this river see report of survey made in 1899, Annual Report of the Chief of Engineers for 1900, page 3018.

The approved project proposes to remove surface obstructions, cut down overhanging trees, and build wing dams and training walls where necessary, so as to permit the passage of boats drawing 2½ feet during ordinary low-water season.

The approved project for the expenditure of the funds available at the beginning of the fiscal year called for work on Pennyroyal, Pattys, and Cement shoals, the first three shoals above the mouth of the river with a depth of less than 2 feet, and the construction of certain floating plant.

One quarter boat, 13 by 65 by 3 feet, and 4 rock barges, 14 and 16 by 60 feet, were built by hired labor during the summer and fall of 1902.

Active work at Pennyroyal shoals was begun on September 20, a hired steamer being used as tender for the fleet. A quarry was opened one-half mile above the shoals on the right bank, where 1,760 cubic yards of riprap were quarried and used in the construction of a dam 880 feet long, on the left side of the chute at Pennyroyal shoals, and a tie dam 170 feet long connecting it with the bank about opposite the

middle portion. Two thousand and twenty cubic yards of bowlders and gravel were excavated from the channel and used to pad the bar on the right side of the channel. The work was completed on December 16 and the fleet moved to Knoxville for the winter.

A request from steamboat men and others interested in the navigation of the river that Red Bank (or Seven Island) shoals be improved in advance of work at Pattys and Cement shoals, on account of the greater difficulties of navigation at the former, due to the crooked channel and greater velocity, having been received, authority was obtained for work at that point.

In the latter part of May the steamer *City of Loudon* was chartered, and towed the United States floating plant, consisting of 1 derrick boat, 1 quarter boat, and 2 barges, to Seven Island (or Red Bank) shoals, where it arrived on the 30th. Between that date and the end of the fiscal year the following work was accomplished:

A quarry was cleared and opened, from which 870 cubic yards of stone were taken. Of this quantity 290 cubic yards were used in raising and constructing dams. A loading derrick was erected at the quarry and an incline of pine poles made to facilitate loading on barges. Seven gauges were established along Seven Island shoals. A quantity of timber was cut for repairing cribs, and a survey of the channel at Tuckahoe and Red Bank was made.

The balance available June 30, 1903, will probably all be expended in continuing the work at Seven Island shoals.

The traffic on this river above the marble-quarry district, extending but a few miles above its mouth, does not seem to justify any expensive work of improvement; an occasional appropriation for removing snags and other channel obstructions, for repairing and maintaining existing works, and for work at any points where trouble may arise in the future should suffice.

#### *Money statement.*

July 1, 1902, balance unexpended .....	\$16,402.61
June 30, 1903, amount expended during fiscal year .....	7,957.81
<hr/>	
July 1, 1903, balance unexpended .....	8,444.80
July 1, 1903, outstanding liabilities .....	833.74
<hr/>	
July 1, 1903, balance available .....	7,611.06
<hr/>	
Amount (estimated) required for completion of existing project .....	65,000.00

#### APPROPRIATIONS.

June 14, 1880 .....	\$10,000	July 13, 1892 .....	\$15,000
March 3, 1881 .....	3,500	August 18, 1894 .....	7,000
August 2, 1882 .....	5,000	June 3, 1896 .....	5,000
July 5, 1884 .....	3,500	March 3, 1899 .....	5,000
August 5, 1886 .....	6,000	June 13, 1902 .....	15,000
August 11, 1888 .....	10,000	<hr/>	
September 19, 1890 .....	10,000	Total .....	95,000

# 1618 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

## COMMERCIAL STATISTICS.

### *French Broad River, Tennessee.*

Articles.	Year ending Dec. 31, 1902.	
	Tons.	Estimated value.
Coal.....	1,315	\$2,624
Fertilizer.....	75	1,500
General merchandise.....	743	20,125
Grain.....	2,774	75,550
Hay and straw.....	2,225	28,525
Live stock.....	237	45,000
Logs and wood.....	9,502	68,721
Lumber.....	3,905	49,808
Marble.....	67,000	1,340,000
Produce.....	793	87,110
Sand.....	67,500	45,000
Stone.....	1,610	8,050
Total.....	157,819	1,810,772

Floated down in rafts (logs and lumber)..... tons.. 8,722  
Number of passengers transported (1902)..... 940

### *Details for the year 1902.*

Between what points.	Miles on French Broad River.	Passen- gers.	Tons.
Logs and lumber rafted:			
Mouth of Big Pigeon River and Knoxville.....	79.5		6,066
Dandridge and Knoxville.....	46.5		480
Dandridge and Loudon.....	46.5		300
Cattlettsburg and Sevierville and Knoxville.....	28.6		2,016
Moved by steamboats:			
Leadvale and Kingston.....	60.5	340	6,047
Leadvale and Knoxville.....	60.5	250	5,099
Marble quarries and Knoxville.....	8.5	350	126,354
Moved by flatboats:			
Seven Islands and Knoxville.....	14		37
Marble quarries and lime works near Knoxville.....	8.5		1,610
Total.....		940	157,819

The total number of craft operating in the river during the year ending December 31, 1902, was 4 steamboats of a total of 256 tons burden, net, and 25 barges of a total capacity of 1,970 tons, as shown on accompanying list.

### *Craft operating on French Broad River, Tennessee.*

Name.	Net ton- nage.	Barges.		Between what points.	Miles on French Broad River.
		Number.	Ton- nage.		
Bill Tate.....	68	7	385	Leadvale and Kingston.....	60.5
Flora Swann.....	57	8	840		
Oliver King.....	42	4	380	Marble quarries and Knoxville.....	8.5
Isabella King.....	89	4	380		
Barge.....		1	15	Seven Islands and Knoxville.....	14
Do.....		1	10		
				Marble quarries and lime works near Knoxville.	8.5
Total.....	256	25	1,970		

These steamboats are also reported as plying on the Tennessee River above Chattanooga Tenn., and the *Bill Tate* and *Flora Swann* again on the Clinch River.

## EE 4.

## IMPROVEMENT OF CLINCH, HIWASSEE, AND HOLSTON RIVERS, TENNESSEE AND VIRGINIA.

## (a) CLINCH RIVER.

The river and harbor act of June 13, 1902, appropriated \$18,000 for improving the Clinch, Hiwassee, and Holston rivers. Of this amount \$3,000 was allotted to the improvement of the Clinch River. By the provisions of the act stated the improvement was to be by clearing the channel.

Nine rough flatboats, 3 and 4 feet wide, 16 feet long, and 15 inches deep, were built at St. Paul, Va., between August 11 and August 14, 1902; camping outfit, tools, and blasting material were shipped from Knoxville, and a party of 25 men was organized by Overseer J. T. Shipp, who was in charge of immediate operations, while Superintendent R. R. Thacher exercised general supervision over fitting out and the work of the party.

Active operations commenced 12 miles below St. Paul, Va., at the mouth of Guests River, and were continued to the mouth of the Clinch. The party was on the water from August 25 to December 1, when it landed at Rockwood Landing, on the Tennessee, and turned over the property to the party working at the latter place.

The extent, character, and location of the work executed is fully shown by the following table submitted by Overseer Shipp:

Location of work.	Distance from Kingston, Tenn.		Trees cut and stumps grubbed.	Snags removed.	Crib dams built, filled with riprap.	Riprap dams built.	Sand and gravel bars removed.	Boulder bars removed.	Rock ledges blasted and removed.	Fish-trap dams removed.	Boulders removed from channel.
	Miles.	No.									
Mouth of Guests River to Kennedys Island											
Kennedys Island	330	8				711			44		45
Rameys bar		18						277	312		106
Porters Cliff									22		
Pendletons Island		36									
Farmers Bend	315	18						26	20		
Blue Cliff								1,131			
Hagens Island	313					956					956
Coxes Island		7	2			595		595			
Busters shoals	311					280				44	
Dingus bar		75									
Stony Creek		11				431		718			33
Starnes Bend		1									
Crafts Dam						277					
One mile below Venables Dam		1								28	
Rogers shoals:											
The Auger	267	1									
Rounds						298			10		111
Lower End					348	180			115		
Big Fall									236		
Tignors Bend		10									
Mouth of North Fork		47					389				
Levassys		13			27		107				

<sup>a</sup>To grade.

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Location of work.	Distance from Kings- ton, Tenn.		Trees cut and stumps grubbed.	Snags removed.	Crib dams built, filled with riprap.	Riprap dams built.	Sand and gravel bars removed.	Boulder bars re- moved.	Rock ledges blasted and removed.	Fish-trap dams re- moved.	Boulders removed from channel.
	Miles.	No.	No.	Cu. yds.	Cu. yds.	Cu. yds.	Cu. yds.	Cu. yds.	Cu. yds.	Cu. yds.	Cu. yds.
Garland Island		5					189				
Neal Fields									35		13
Joe Mills Bend										33	
Greshams Island									42		10
T. Collins									35		
Hopsons Shoals		27									
Sycamore Shoals		24									
Big Creek									3		
Bull Bluff									18		
Gauge Hole									8		
Big Slip										53	
Bunches										28	
Near Sheltons Cliff									16	61	
Near Punchoon Camp										10	
Hopsons Eddy		2									
State Road										15	
Straight Shoals		27			131	5				30	3
Long Bottom										10	
Wilson Shoals										10	
Hunter Shoals									2		
Cut-off Island	150	20									
Hibbs Island		3							75		
Stukesbury Landing		6									
Mouth of Powells River	97		1								
Llewellyn Shoals						62					
Blacks Island	52				80				80		
Total		300	3		588	3,735	685	2,747	860	388	1,420

<sup>a</sup> Quarried.

Additional work on the Clinch River for the present is not recommended.

### Money statement.

July 1, 1902, balance unexpended	\$5,122.83
June 30, 1903, amount expended during fiscal year	4,193.95
July 1, 1903, balance unexpended	928.87
July 1, 1903, outstanding liabilities	28.84
July 1, 1903, balance available	900.03

### APPROPRIATIONS.

The following appropriations have been made for this improvement:

Act of—		Act of—	
June 14, 1880	\$10,000	July 13, 1892	\$4,000
March 3, 1881	3,000	August 18, 1894	2,500
August 2, 1882	3,000	March 3, 1899	8,500
July 5, 1884	5,000	June 13, 1902 (allotment)	3,000
August 5, 1886	5,000		
August 11, 1888	5,000	Total	53,000
September 19, 1890	4,000		



## APPENDIX E E—REPORT OF CAPTAIN BARDEN.

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## COMMERCIAL STATISTICS.

Articles.	Year ending Dec. 31, 1902.	
	Tons.	Estimated value.
Brick.....	150	\$656
Coal.....	360	730
Fertilizer.....	1,431	28,620
Flour.....	264	11,220
Grain.....	13,230	308,900
General merchandise.....	9,314	1,046,059
Hay and straw.....	3,832	63,317
Live stock.....	325	52,000
Logs and wood.....	61,908	489,464
Lumber.....	3,223	38,716
Marble.....	749	14,980
Produce.....	2,787	156,525
Railroad ties.....	144	345
Sand.....	27,000	18,000
Tan bark.....	199	2,826
Telegraph poles.....	5,000	40,000
Total.....	129,925	2,272,348

Floated down in rafts, 65,305 tons.

Number of passengers transported (1902), 3,758.

*Details of the traffic for 1902 are shown in the following table.*

Between what points.	Miles on Clinch River.	Passen- gers.	Tons.
Logs and poles rafted:			
Speers Ferry, Va., and Chattanooga.....	168.6		42,400
Dungannon, Va., and Chattanooga.....	165.6		4,000
Hancock County, Tenn., and Chattanooga.....	146		212
Speers Ferry, Va., and Clinton, Tenn.....	114		100
Clinton and Chattanooga.....	59		13,000
Clinton and Knoxville.....	59		5,098
Kingston and Loudon.....	.8		500
Moved by steamboats:			
Clinton, Tenn., and Kingston.....	59		67
Clinton and Harriman.....	55		488
Kingston and Harriman.....	3.7	47	180
Kingston and Rockwood.....	.8	100	1,027
Kingston and Loudon.....	.8	900	3,301
Kingston and Chattanooga.....	.8	2,136	50,037
Kingston and Knoxville.....	.8	235	3,473
Kingston and Leadvale.....	.8	340	6,047
Total.....		3,758	129,925

The above table shows that approximately 50 per cent of the tonnage for 1902 was transported a distance of about 1 mile.

*Craft operating in Clinch River.*

Of the 5 steamboats reported in last annual report as plying on the Clinch River, the *Charles H. Bacon*, *Grady*, and *Joe Wheeler* were not in this service during the year, but the number of barges was increased from 17 to 24.

Five additional boats were put on, as follows:

Names of steamboats.	Length.	Width.	Depth.	Net ton- nage.	Height of pilot house.	Height of smoke- stack.	Num- ber of barges.	Capac- ity of barges.
	<i>Feet.</i>	<i>Feet.</i>	<i>Feet.</i>		<i>Feet.</i>	<i>Feet.</i>		<i>Tons.</i>
City of Loudon.....	75	12	2	23	17	20	2	60
Flora Swann.....	98	13	2.8	57	25.7	30	8	440
Gasconade.....	107.4	23.0	3.5	74	30	45	1	125
N. B. Forrest.....	136	25	3.5	134	35	40	1	125
W. T. Gallaher.....	77	14	2.5	27	21	27	2	600

# 1622 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

The total number of craft operating in this river during the year ending December 31, 1902, was 7 steamboats, of a total of 407 tons burden net, and 24 barges, of a total capacity of 1,992 tons, as shown on list below.

Names.	Net tonnage.	Barges.		Between what points.	Miles on Clinch River.
		Number.	Tonnage.		
Clinch.....	24	2	150	(Clinton and Kingston.....	59
Bill Tate.....	68	7	985	(Clinton and Harriman.....	55
Do.....		1	107	(Kingston and Harriman.....	3.7
City of Loudon.....	23	2	60	Kingston and Leadvale.....	.8
Flora Swann.....	57	8	440	Kingston and Knoxville.....	.8
Gasconade.....	74	1	125	Kingston and Loudon.....	.8
N. B. Forrest.....	134	1	125	Kingston and Leadvale.....	.8
W. T. Gallaher.....	27	2	600	Kingston and Chattanooga.....	.8
				do.....	.8
				Kingston and Rockwood Landing.....	.8
Total.....	407	24	1,992		

These steamboats are also reported as plying on the Tennessee River above Chattanooga, Tenn., and two of them, the *Bill Tate* and *Flora Swann*, also on the French Broad River.

## (b) HIWASSEE RIVER.

For detailed description see Annual Report of the Chief of Engineers for 1901, page 2459 et seq.

The approved project for the Hiwassee River is for a navigable channel from its junction with the Tennessee River to the mouth of the Ocoee River of not less than 116 feet in width, 30 inches mean channel depth, and 3 feet maximum depth. To secure this channel work is required on 16 shoals.

The work during the year was as follows: One quarter boat, 65 feet long, 16 feet wide, and 3 feet deep, was built at Knoxville during the fall and winter. In the early part of May the fleet, consisting of this quarter boat, 2 hired rock barges, 1 derrick boat from the upper Tennessee River, and 1 barge and the U. S. S. *McPherson*, from the lower Tennessee, was assembled and the working party organized. On May 13 the work of clearing the channel of sunken logs and bowlders, which had accumulated since the expenditure of the last previous appropriation of 1890, was begun. This work was finished June 19, 1903, the channel having been cleared to the mouth of the Ocoee, 35 miles from the mouth.

The obstructions removed were as follows: Trees cut from bank, 2,202; saplings cut, 77; logs removed from channel, 34; trees removed from channel, 19; snags pulled, 82; stone taken from channel, 50 cubic yards.

A quarry was then opened preparatory to beginning work on the improvement of the channel at Mathews shoals.

The balance available June 30, 1903, will be applied to the continuation of the work at Mathews shoals, and will probably be sufficient to complete the work at that place.

Any additional appropriations made should be spent on Agency shoals, just below Mathews shoals, and Rogers shoals, just above. With these shoals improved it is believed that an occasional appropriation for removing snags and other channel obstructions, for repairing and maintaining existing works, and for work at any places where trouble may develop in the future, is all that will be justified by the present or prospective commerce on the river.

*Money statement.*

July 1, 1902, balance unexpended .....	\$10,000.00
June 30, 1903, amount expended during fiscal year .....	3,873.74
July 1, 1903, balance unexpended .....	6,126.26
July 1, 1903, outstanding liabilities .....	764.82
July 1, 1903, balance available .....	5,361.44
(Amount (estimated) required for completion of existing project .....	61,125.00
Amount that can be profitably expended in fiscal year ending June 30, 1905, for works of improvement, in addition to the balance unexpended July 1, 1903 .....	5,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

## APPROPRIATIONS.

Act of—		Act of—	
August 14, 1876 .....	\$10,000	August 15, 1886 .....	\$2,500
June 13, 1878 .....	10,000	August 11, 1888 .....	1,000
March 3, 1879 .....	3,000	September 19, 1890 .....	1,500
June 14, 1880 .....	3,000	June, 18, 1902 (allotment) ..	10,000
March 3, 1881 .....	1,500		
August 2, 1882 .....	1,500	Total .....	46,500
July 5, 1884 .....	2,500		

## COMMERCIAL STATISTICS.

Articles.	Year ending Dec. 31, 1902.	
	Tons.	Estimated value.
Brick .....	28	\$120
Cotton .....	105	18,900
Cotton seed .....	33	700
Fertilizer .....	300	6,000
Flour .....	1,000	40,000
General merchandise .....	689	57,430
Grain .....	2,184	100,000
Hay .....	275	5,200
Live stock .....	42	6,720
Logs and wood .....	2,014	9,612
Lumber .....	400	5,000
Marble .....	25	500
Produce .....	466	35,225
Railroad ties .....	1,250	3,000
Sand .....	1,500	1,000
Tanbark .....	780	10,800
Telephone poles .....	5,000	40,000
Total .....	16,041	340,207

Floated down in rafts, 6,014 tons.

Number of passengers transported (1902), 638.

## 1624 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

Details of the traffic for 1902 are shown in the following table:

Between what points.	Miles on Hiwassee River.	Passen- gers.	Tons.
Logs and poles rafted:			
Out of Ocoee River to Chattanooga.....	34.7		5,000
Mouth of Ocoee River to Chattanooga.....	34.7		1,000
Charleston, Tenn., to Chattanooga.....	19		10
Mouth of Ocoee River to Savannah Landing, Tenn.....	4		4
Moved by steamboat and barges:			
Mouth of Ocoee River to Chattanooga.....	34.7	638	10,027
Total.....		638	16,041

But one steamboat, the *Sam A. Connor*, of 63 tons burden net, with two barges of a total capacity of 70 tons, navigated the river during the year 1902.

## (c) HOLSTON RIVER.

The river and harbor act of June 13, 1902, appropriated \$18,000 for improving the Clinch, Hiwassee, and Holston rivers. Of this amount \$5,000 was allotted to the improvement of the Holston River. By the provisions of the act stated, the improvement was to be by clearing the channel. This was the first appropriation for the improvement of the Holston River.

Three small flatboats and two bateaux were built at Rotherwood, Tenn., and on August 27, 1902, the working party was organized and started downstream, under the immediate charge of Overseer D. R. Hicks. Superintendent R. R. Thacher exercised general supervision over fitting out, and the work of the party.

Active operations commenced at Ridley's shoals, 137 miles above the mouth of the river, and were continued to the mouth, which was reached November 28.

The extent, character, and location of the work executed is shown by the following table:

Locality	Dis- tance above mouth.	Rock reefs blasted and re- moved from channel.	Loose rock re- moved from channel.	Trees cut.	Snags re- moved.	Fish- trap dams re- moved.	Coffer- dams around bridge piers re- moved.
	Miles.	Cu. yds.	Cu. yds.	No.	No.	Cu. yds.	Cu. yds.
Ridley's shoals.....	137	50					
Chestnut and Kirkpatrick's fish- trap dam.....	101					25	
Clouds shoals.....	98	22					
Mooney's fish-trap dam.....	95					10	
Poor Valley shoals.....	88	58					
Horseshoe bend.....	49	20			3		
Smoky shoals.....	43	68	1,000	5	2		
Lost Creek shoals.....	38	80	254	39	9	50	
McBees Island.....	32		87	137	8		
Howell's fish-trap dam.....	21					100	
Strawberry Plains.....	18	372	50	614	54		70
Brooks's fish-trap dam.....	16					300	
Saylor's shoals.....	15		458	1,378	4		
Dopes bar.....	11		120			65	
McMillans Station.....	10					55	
Armstrongs.....	5	50	175	349	4	100	
Total.....		720	2,144	2,523	84	706	70

Additional work on the Holston River for the present is not recommended.

APPENDIX E E—REPORT OF CAPTAIN BARDEN. 1625

*Money statement.*

July 1, 1902, balance unexpended .....	\$5,000.00
June 30, 1903, amount expended during fiscal year .....	3,223.90
July 1, 1903, balance unexpended .....	1,776.10

APPROPRIATION.

July 1, 1902 (allotment) .....	\$5,000.00
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COMMERCIAL STATISTICS.

Articles.	Year ending Dec. 31, 1902.	
	Tons.	Estimated value.
Logs .....	6,986	\$55,894
Lumber .....	2,150	25,800
Total .....	9,136	81,694

Logs and lumber rafted as follows:

Between what points.	Miles on Holston River.	Tons.
Kingsport, Tenn., and Knoxville .....	142.5	7,136
Kingsport, Tenn., and Austin's mills, near Rogersville, Tenn. ....	25	2,000
Total .....		9,136



## APPENDIX F F.

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### IMPROVEMENT OF OHIO RIVER BY OPEN-CHANNEL WORK AND CONSTRUCTION OF LOCK AND DAM NO. 37; OPERATING SNAG BOATS ON OHIO RIVER.

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REPORT OF COL. G. J. LYDECKER, CORPS OF ENGINEERS, OFFICER  
IN CHARGE, FOR THE FISCAL YEAR ENDING JUNE 30, 1903, WITH  
OTHER DOCUMENTS RELATING TO THE WORKS.

#### IMPROVEMENTS.

- |  |  |
|--|--|
| 1. Ohio River (general improvement).                   | 3. Operating snag boats on Ohio River. |
| 2. Construction of Lock and Dam No. 37,<br>Ohio River. |  |
- 

UNITED STATES ENGINEER OFFICE,  
*Cincinnati, Ohio, July 18, 1903.*

GENERAL: I have the honor to transmit herewith the annual reports  
of the works under my charge for the fiscal year ending June 30, 1903.

Very respectfully, your obedient servant,

G. J. LYDECKER,  
*Colonel, Corps of Engineers.*

Brig. Gen. G. L. GILLESPIE,  
*Chief of Engineers, U. S. A.*

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## F F 1.

### IMPROVEMENT OF OHIO RIVER.

#### GENERAL IMPROVEMENT.

Operations on this improvement were in progress during the last  
fiscal year under the general project that has been in force for many  
years, as follows:

Dredging at Five-mile bar, 455 miles below Pittsburg, was in prog-  
ress from August 25 to November 30, 1902, and resulted in a chan-  
nel 3,400 feet long, 210 feet wide, and 6 feet deep at low water. The  
work was done by the U. S. dredges *Ohio* and *Oswego*, assisted by  
one other dredge serving under contract. The total excavation was  
120,115 cubic yards of cemented gravel, sand, and bowlders, of which  
76,166 cubic yards were removed by the United States dredges, and

43,949 cubic yards by the hired dredge. Much of the material had to be broken up by blasts of dynamite before dredging, and 57 large rocks, weighing 200 tons in all, were drilled and blasted before removal. The result of the work was to provide a good permanent channel through one of the most troublesome bars in this part of the river. On completing this work, the United States dredges went into winter quarters and did not resume work until June 18, 1903. In the meantime all the dredging plant underwent considerable repairs.

Dredging at Twin creek bar, 373 miles below Pittsburg, was in progress from June 18 to 30, 1903, but operations were so interrupted by high water and the passage of coal fleets that only 4,345 cubic yards of sand, gravel, and boulders were excavated.

The work of rock excavation at the bar at mouth of Licking, 468.4 miles below Pittsburg, was resumed July 19, and continued until December 10, 1902, but with considerable interruption on account of high water until the end of July. During the season 4,564 cubic yards of solid rock were drilled and blasted, and 28,121 cubic yards of blasted rock, loose rock, gravel, and sand were removed by dredging. In the work of drilling and blasting, which was done by hired labor and Government plant, 3,694 holes, aggregating 12,675 feet in length, were drilled, and 8,825 pounds of dynamite used in blasting. The work of dredging and disposal of dredged material was done by plant employed under contract. The cost of this work during the fiscal year, including all items of expense except that attaching to the general office, was \$3.23 per cubic yard of material excavated. The stage of water that has prevailed during the first half of the present calendar year has prevented resumption of work since operations were suspended, but it is anticipated that this improvement may yet be completed by the end of the current working season unless the river conditions be very unfavorable.

*Ice piers.*—Projects for rebuilding the ice piers at Middleport and Gallipolis, Ohio, and for constructing new ones at Maysville, Ky., and near the mouth of the Big Hocking, in accordance with the provisions of the river and harbor act of June 13, 1902, were approved July 21, July 28, and July 31, 1902, respectively. Surveys and borings were subsequently made at the localities indicated for the new structures, their locations fixed upon, and the qualified relinquishments of riparian rights obtained, as required by law, from owners of property abutting on the proposed new harbors, except as respects one piece at the selected Maysville site; but it was not practicable to commence any work of construction before the close of the working season of 1902. The necessary machinery for use in construction and repairs was purchased in the spring of 1903, placed in position during June, and about ready for commencing operations at Harris Ferry, the site selected near the mouth of the Big Hocking, at the close of the fiscal year. It is expected that the pier at this place and the work of rebuilding the piers at Middleport and Gallipolis will be completed during the current working season. Work at Maysville will be held in abeyance while further effort is made to obtain relinquishment of rights attaching to the one piece of property above referred to, or a new site for that pier determined upon.

*Low dikes and dams.*—Under a contract made with James Short, of St. Charles, Mo., approved August 13, 1900, provision was made for building a new dike 1,290 feet long near Mound City, Ill., and for repairing an old dike adjoining the site of the new one and extending it 740 feet, but up to the beginning of the last fiscal year nothing had



been done by the contractor except to bring about 1,000 cubic yards of stone to the vicinity and unload it on the bank of the river. No work was done during the last year and the contract expired by limitation November 30, 1902. The principal reason for the contractor's failure to carry out his contract was, undoubtedly, the high stages of water that prevailed in the locality during the working seasons of 1900, 1901, and 1902, but in spite of this unfavorable condition of affairs something might have been accomplished each season if the contractor had been properly prepared to take advantage of the few brief periods during which work could and should have been vigorously carried on. It is now proposed to modify the plan of dams so as to justify working at higher stages of water than was permissible under the original plan and specifications.

No repairs of old dikes or dams were found to be of urgent necessity, and for this reason no work of that nature was undertaken during the season of 1902 in view of the exceptionally unfavorable river conditions that prevailed during most of that period.

*Surveys.*—Several parties were in the field engaged in surveys for locating harbor lines, or projecting future improvements, the principal work of this character being as follows: For locating harbor lines on both banks of the river in the vicinities of Steubenville, Ohio, and Ashland, Ky., surveys covering distances of 6.8 and 9.05 miles, respectively, were made; and for use in preparing projects and plans for future improvements at places in the lower river, surveys covering in the aggregate 47.2 miles were made in the vicinities of mouth of Green River, Caseyville, Ky., Elizabethtown, Ill., Little Chain, Ogden Landing, and Mound City to Cairo, Ill. The field work for these surveys was in progress from September 24 to December 17, 1902.

*Permits from War Department.*—Work in connection with special permits has been almost continuous during the fiscal year, and has absorbed a great deal of time, both in field and office, for necessary preliminary examinations and reports and subsequent supervision of the work authorized. The total number of such permits issued during the year and pertaining to this district was 32, of which 23 were for oil or gas pipe crossings, 3 for telephone crossings, and 6 for miscellaneous purposes.

#### ESTIMATE.

The balance of the funds now available will be applied during the current fiscal year in accordance with the project, in dredging, rock excavation, construction and repairs of ice piers, low dikes and dams, surveys, and general contingencies of supervision, engineering, and office.

For further operations under the general project of improvement, for continuing the general survey of the river down to its mouth, in continuation of work recently completed as far down as the Big Miami, and for procuring a much more efficient working plant for open-channel improvement additional funds are urgently needed, as indicated in the money statement below, and the appropriation of that sum is recommended with all permissible force.

Subreports of assistants in charge of the principal work referred to above are submitted herewith and furnish interesting detailed information, as follows: Reports by Chief Assistant Engineer R. R. Jones on (1) removing rock bar at mouth of Licking, (2) dike near mouth of Tradewater, and (3) ice piers, and reports by Assistant Engineer E. J. Carpenter on dredging operations.

# 1630 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

## Money statement.

July 1, 1902, balance unexpended .....	<sup>a</sup> \$497,783.85
December 10, 1902, amount received from sale of condemned property .....	46.85
	<hr/> 497,830.70
June 30, 1903, amount expended during fiscal year .....	123,233.87
	<hr/> 374,596.83
July 1, 1903, balance unexpended .....	
July 1, 1903, outstanding liabilities .....	7,894.61
	<hr/> 366,702.22
July 1, 1903, balance available .....	
July 1, 1903, amount covered by uncompleted contracts .....	26,652.34
	<hr/> Indefinite.
(Amount (estimated) required for completion of existing project ..	
Amount that can be profitably expended in fiscal year ending June	
30, 1905, in addition to the balance unexpended July 1, 1903:	
For works of improvement .....	\$400,000.00
For maintenance of improvement .....	100,000.00
	<hr/> 500,000.00
Submitted in compliance with requirements of sundry civil act of	
June 4, 1897, and of section 7 of the river and harbor act of 1899.	

## Statement of amounts and dates of all appropriations for this work.

Act of Congress.	Appropriation.	Allotment.	Remarks.
March 3, 1827 .....	\$30,000.00	.....	
March 3, 1835 .....	50,000.00	.....	
July 2, 1836 .....	20,000.00	.....	
March 3, 1837 .....	60,000.00	.....	
July 7, 1838 .....	50,000.00	.....	
June 11, 1844 .....	100,000.00	.....	
March 3, 1847 .....	6,479.25	.....	
August 30, 1852 .....	90,000.00	.....	
June 23, 1866 .....		\$172,000.00	Improving Mississippi, Missouri, Arkansas, and Ohio rivers.
Do .....		80,000.00	Snag boats and apparatus for improving Western rivers.
March 2, 1867 .....	100,000.00	.....	
July 26, 1868 .....		85,000.00	Repair, preservation, extension, and completion of river and harbor works.
July 11, 1870 .....	50,000.00	.....	
March 3, 1871 .....	50,000.00	.....	
June 10, 1872 .....	200,000.00	.....	
March 3, 1873 .....	200,000.00	.....	
June 23, 1874 .....	150,000.00	.....	
March 3, 1875 .....	300,000.00	.....	
August 14, 1876 .....	175,000.00	.....	
June 18, 1878 .....	300,000.00	.....	
Do .....	50,000.00	.....	Harbor of refuge at or near Cincinnati.
March 3, 1879 .....	250,000.00	.....	
June 14, 1880 .....	250,000.00	.....	
March 3, 1881 .....	850,000.00	.....	
March 21, 1882 .....	100,000.00	.....	Continuing work on Davis Island dam.
August 2, 1882 .....	350,000.00	.....	
Do .....	16,000.00	.....	Harbor of refuge near Cincinnati, Ohio.
July 5, 1884 .....	600,000.00	.....	
Do .....	17,000.00	.....	Do.
August 5, 1886 .....	375,000.00	.....	
August 11, 1888 .....	380,000.00	.....	
September 19, 1890 .....	300,000.00	.....	
January 19, 1891 .....	2,128.87	.....	Relief of Stubbs & Lackey. Treasury settlement No. 2593.
July 13, 1892 .....	360,000.00	.....	
August 18, 1894 .....	250,000.00	.....	
June 3, 1896 .....	250,000.00	.....	
July 1, 1898 .....		15,000.00	For restoring levee and banks of Ohio River at or near Shawneetown, Ill.
March 3, 1899 .....	375,000.00	.....	
June 13, 1902 .....	359,000.00	.....	Amount appropriated, \$400,000. \$41,000 being for Falls of Ohio River, at Louisville, Ky.
July 1, 1902 .....	25,000.00	.....	Between Cairo and Mound City.
Total .....	6,500,608.12	352,000.00	

<sup>a</sup> Amount appropriated by deficiency act July 1, 1902, improving Ohio River between Cairo and Mound City, \$25,000, undrawn and not included in amount available.

# APPENDIX F F—REPORT OF COLONEL LYDECKER. 1631

Total of appropriations, 1827-1903.....	\$6,590,808.12	
Total of allotments, 1827-1898.....	352,000.00	
Received from sales, 1806-1903.....	7,837.35	
		\$6,950,445.47
Appropriations not drawn, 1827, 1852.....	5,023.47	
Appropriation not drawn, 1902 (between Cairo and Mound City).....	25,000.00	
Allotments not drawn, 1866, 1868.....	43,134.60	
Returned by Treasury settlements.....	30.07	
Amounts transferred to other works.....	125,168.44	
		198,856.58
Total.....		6,752,088.89

## LIST OF CONTRACTS IN FORCE DURING THE FISCAL YEAR ENDING JUNE 30, 1903.

### FORMAL CONTRACTS.

*Constructing dikes in the Ohio River near Mound City, Ill.*—James Short, July 30, 1900; approved August 13, 1900; commence twenty days after receipt of notification of approval of contract; terminate November 30, 1900, if stage of water permits; extended to November 30, 1901; extended to November 30, 1902; contract expired by limitation November 30, 1902.

*Hire of towboat and crew as tender to United States dredges.*—The Smiley Towboat Company, August 20, 1902; approved August 28, 1902; commence when ordered; terminate about December 1, 1902; towboat discharged December 5, 1902.

*Hire of towboat and crew as tender to United States dredges.*—The Smiley Towboat Company, June 4, 1903; approved June 12, 1903; to commence when ordered; terminate about December 1, 1903.

### EMERGENCY CONTRACTS.

*Hire of dredge.*—Kanawha and Ohio Company, June 3, 1902; commence within ten days after receipt of order; terminate when discharged; plant discharged December 9, 1902.

*Hire of one flatboat.*—S. N. Galbreath and Amos White, June 3, 1902; commence within ten days after receipt of order; terminate when discharged; discharged December 10, 1902.

*Hire of one flatboat.*—S. N. Galbreath, June 3, 1902; commence within ten days after receipt of order; terminate when discharged; discharged December 10, 1902.

*Hire of two flatboats.*—Oscar F. Barrett, June 3, 1902; commence within ten days after receipt of order; terminate when discharged; discharged December 10, 1902.

*Dynamite, exploders, etc.*—Hercules Powder Company, June 4, 1902; commence when ordered; terminate December, 1902; completed December 10, 1902.

*Hire of two flatboats.*—T. J. Hall, June 7, 1902; commence within ten days after receipt of order; terminate when discharged; discharged December 10, 1902.

*Hire of towboat.*—W. J. Duffy, June 9, 1902; commence within ten days after receipt of order; terminate when discharged; towboat discharged December 12, 1902.

*Hire of dredging plant.*—Sheridan-Kirk Contract Company, August 21, 1902; commence when ordered; terminate when discharged; discharged November 29, 1902.

*Docking and repairing boats.*—Howard & Co., August 25, 1902; commence within three weeks after receipt of notice; terminate in five weeks; completed September 27, 1902.

*Rebuilding water gauge at Paducah, Ky.*—Stinchfield & Saunders, September 15, 1902; commence fifteen days after receipt of notice; terminate in thirty fair working days; completed October 25, 1902.

*One boiler.*—The Roberts Safety Water Tube Boiler Company, March 3, 1903; commence fifteen days after signature of contract and complete in ninety days from date of contract; completed June 2, 1903.

*Hire of one flatboat.*—S. N. Galbreath, June 4, 1903; commence within ten days after receipt of order; terminate when discharged.

*Hire of one flatboat.*—S. N. Galbreath and Amos White, June 4, 1903; commence within ten days after receipt of order; terminate when discharged.

*Hire of three flatboats.*—Oscar F. Barrett, June 5, 1903; commence within ten days after receipt of order; terminate when discharged.

*Hire of towboat.*—B. J. Riggs, June 5, 1903; commence within ten days after receipt of order; terminate when discharged.

# 1632 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

*Hire of dredge.*—Kanawha and Ohio Company, June 10, 1903; commence within ten days after receipt of order; terminate when discharged.

*Iron and steel.*—Wm. T. Johnson Company, June 15, 1903; commence in ten days; terminate in thirty days.

*Dynamite, exploders, etc.*—Hercules Powder Company, June 15, 1903; commence when ordered; terminate December, 1903.

*Cement.*—The Atlas Portland Cement Company, June 18, 1903; commence in ten days; terminate when entire quantity required is delivered.

## STAGES OF OHIO RIVER IN 1902.

The following are the records of the gauges at Pittsburg, Cincinnati, and Evansville, which may be taken to represent the navigable condition of the upper, middle, and lower Ohio.

### Gauge of Davis Island Dam, near Pittsburg, Pa.

[When the dam is up low-water readings must be obtained from the gauge at the lower end of the lock. On this gauge 3 feet 2 inches corresponds to a navigable depth of 3 feet, and 6 feet corresponds to the same depth in the river.]

Month.	Depth in channel.			Gauge readings.	
	Under 3 feet.	3 feet and over.	6 feet and over.	Highest.	Lowest.
1902.	<i>Days.</i>	<i>Days.</i>	<i>Days.</i>	<i>Feet.</i>	<i>Feet.</i>
January.....	0	31	9	14.3	3.3
February.....	0	28	9	13.2	3.6
March.....	0	31	31	29	6.6
April.....	0	30	25	19.4	5.2
May.....	0	31	12	7.4	4
June.....	0	30	1	6	3.5
July.....	0	31	28	15.2	4.8
August.....	8	23	6	8.3	2.4
September.....	30	0	0	2.6	1.7
October.....	6	25	4	9.2	2.7
November.....	20	10	4	9.6	2.6
December.....	0	31	28	16.8	5.4
Total.....	64	301	157	-----	-----

### Cincinnati gauge.

[The zero of this gauge is about 2 feet below low water. Readings of about 4 feet correspond to about 3 feet in the channel, and those of 7 feet to about 6 feet in the channel.]

Month.	Depth in channel.			Gauge readings.	
	Under 3 feet.	3 feet and over.	6 feet and over.	Highest.	Lowest.
1902.	<i>Days.</i>	<i>Days.</i>	<i>Days.</i>	<i>Feet.</i>	<i>Feet.</i>
January.....	0	31	31	44	8.8
February.....	0	28	28	41.7	8.4
March.....	0	31	31	50.9	16.4
April.....	0	30	30	42.2	14.4
May.....	0	31	31	19	9
June.....	0	30	30	22	8
July.....	0	31	31	27.5	12.6
August.....	0	31	24	15.7	5.8
September.....	0	30	0	5.7	3.9
October.....	0	31	24	12.8	4.4
November.....	0	30	6	15.5	4.9
December.....	0	31	31	47	15.2
Total.....	0	365	297	-----	-----

# APPENDIX F F—REPORT OF COLONEL LYDECKER. 1633

## Evansville gauge.

[The zero of this gauge is about at low-water line. Readings of 2 feet correspond to about 3 feet in the channel, and readings of 6 feet correspond to about 6 feet in the channel.]

Month.	Depth in channel.			Gauge readings.	
	Under 3 feet.	3 feet and over.	6 feet and over.	Highest.	Lowest.
1902.	Days.	Days.	Days.	Feet.	Feet.
January	0	31	31	31.3	6.5
February	0	28	28	35.8	6.4
March	0	31	31	40	16.3
April	0	30	30	30.6	12.6
May	0	31	31	17.7	7.4
June	0	30	27	14	5.8
July	0	31	31	20.8	8.9
August	0	31	21	10.8	8.8
September	19	11	0	4	1.8
October	3	28	5	7.3	2.4
November	10	20	3	8.7	2.5
December	0	31	31	40	9.4
Total	32	333	269		

## STAGES OF THE OHIO RIVER.

Highest, lowest, and average stages of the Ohio River at Cincinnati each calendar year from 1860 to 1902, inclusive, with the highest stage during the floods of 1833 and 1847.

Calendar year.	Highest stage.		Lowest stage.		Average for the year.
	Month.	Stage.	Month.	Stage.	
		Feet.		Feet.	Feet.
1832	February	64.2			
1847	December	63.6			
1860	April	49.2	October	5.3	16
1861	do	49.4	July	5.1	19.1
1862	January	57.3	October	2.3	17.4
1863	March	42.7	do	2.5	15
1864	December	45.1	August	3.1	16.7
1865	March	56.2	October	5.7	21.8
1866	September	42.5	August	4.7	19.2
1867	March	55.7	October	8	17
1868	do	48.2	July	5.1	18.7
1869	April	48.7	August	5.3	19.7
1870	January	55.2	October	3.8	17.8
1871	May	40.5	do	2.7	11.8
1872	April	41.7	do	3	11.7
1873	December	44.4	do	3.7	18.4
1874	January	47.9	September	2.3	15.7
1875	August	55.3	do	4.2	18.7
1876	January	51.7	do	6.2	18.2
1877	do	53.7	October	3.2	15
1878	December	41.3	do	4.3	16.7
1879	do	42.7	do	2.5	14.5
1880	February	53.1	do	3.7	17
1881	do	50.6	September	1.9	16.9
1882	do	54.6	November	6.1	22.1
1883	do	66.3	September	3.6	19.5
1884	do	71	do	2.7	17.3
1885	January	46	do	2.5	15.6
1886	April	55.7	November	3.3	17.8
1887	February	56.2	September	2.7	15.1
1888	April	39.9	August	5.2	17.9
1889	February	38.2	September	5.2	18.5
1890	March	59.2	August	5.7	25.7
1891	February	57.3	October	4.4	20.5
1892	April	43.7	November	3.4	16.5
1893	February	54.9	August	3.6	17.7
1894	do	35.6	September	3.1	12.9
1895	January	48.4	October	2.3	12.2
1896	April	47.8	September	5.5	16.7
1897	February	61.2	October	3.1	16.5
1898	March	61.4	do	4.5	19.7
1899	do	57.4	November	3.4	17.1
1900	December	40	October	3.2	13.8
1901	April	59.7	November	4.2	17.6
1902	March	50.9	September	3.9	16.6

a Prepared from the stages as shown by the waterworks marks daily at 6 a. m. and 6 p. m., the previous and succeeding years having been made from one daily observation at 6 a. m.

## 1634 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

## MONTHLY COMPARISONS OF RIVER AND RAINFALL.

*Highest, lowest, and average monthly stages of the Ohio River, and monthly and annual rainfall, at Cincinnati, in two years, ending December 31, 1901 and 1902.*

Months.	Highest.				Lowest.				Average.		Rainfall.	
	1902.		1901.		1902.		1901.		1902.	1901.	1902.	1901.
	Date.	Feet.	Date.	Feet.	Date.	Feet.	Date.	Feet.	Feet.	Feet.	Inches.	Inches.
January	3	44	17	28.8	23	8.8	11	9.6	19.9	15.5	2.10	0.85
February	2	41.7	8	20.9	23	8.4	28	8.3	19.2	13.8	.78	1.35
March	5	50.9	17	35.9	20	16.4	1	7.6	37.2	23.4	1.47	2.01
April	15	42.2	28	59.7	20	14.4	17	23.9	26.7	30.7	2.87	1.93
May	29	19	1	51.2	22	9	11	16.3	13.6	24.9	5.54	1.02
June	30	22	1	40	12-14-15	8	17	17.7	11	29.1	5.25	2.27
July	8-9	27.5	1	23.8	23	12.6	31	7.4	19.4	13.4	3.47	1.44
August	5	15.7	28	12.5	30-31	5.8	8	5.8	9.9	9.5	.65	.88
September	1	5.7	23	14.6	24-25	3.9	30	8.5	4.4	10.8	4.26	.92
October	19	12.3	5	8.9	1	4.4	30-31	4.8	7.6	6.5	2.77	.59
November	30	15.5	30	11.4	14-15-16	4.9	11	4.2	6.3	5.6	3.29	.74
December	18	47	20	39.5	1-2	15.2	7	10.7	26.9	14.2	5.25	3.57
For the year.	a 5	50.9	b 26	50.7	c 24-25	3.9	d 11	4.2	16.8	17.2	37.30	17.90

a March.

b April.

c September.

d November.

*Losses by collision with bridges.*

The following table shows the reported losses sustained by the commerce of the Ohio River by collision with the piers of bridges crossing the Ohio River to the end of the calendar year 1902.

Date, etc.	Owner.	Steamboat.	Loss.	Amount.
Ohio Connecting Rail-way bridge: July 1, 1902	The Monongahela River Consolidated Coal and Coke Co.	J. B. Williams	1 coal boat, 1 fuel barge of coal.	\$3,500.00
Beaver bridge: Previously reported.				61,840.00
July 4, 1902	The Monongahela River Consolidated Coal and Coke Co.	Cruiser	2 coal boats, 1 coal flat.	6,000.00
Jan. 28, 1902	do.	Fred Wilson	1 coal boat.	2,500.00
Jan. 28, 1902	do.	Josh Cook	1 barge coal.	2,400.00
Dec. 13, 1902	do.	Jim Wood	1 fuel barge of coal.	1,000.00
Total				73,740.00
Steubenville bridge: Previously reported.				118,858.00
Mar. 18, 1902	The Monongahela River Consolidated Coal and Coke Co.	Cruiser	1 coal boat, 1 coal flat.	3,500.00
Total				122,358.00
Bellaire bridge: Previously reported.				148,026.00
July 10, 1902	The Monongahela River Consolidated Coal and Coke Co.	Iron Age	1 barge coal.	2,100.00
Total				150,126.00
Parkersburg bridge: Previously reported.				101,848.47
July 5, 1902	The Monongahela River Consolidated Coal and Coke Co.	Little Fred	2 coal boats, 1 coal flat.	6,000.00
July 5, 1902	do.	Clifton	1 coal boat.	2,500.00
Total				110,848.47

**APPENDIX F F—REPORT OF COLONEL LYDECKER. 1635**

Date, etc.	Owner.	Steamboat.	Loss.	Amount.
Chesapeake and Ohio bridge: July 9, 1902.....	The Monongahela River Consolidated Coal and Coke Co.	Nellie Walton...	1 barge coal.....	\$2,400.00
Ohio Falls bridge: Previously reported. Mar. 12, 1902.....		John Barrett & Son..	T. H. Davis.....	1 barge salt.....
Total.....				22,050.00

NOTE.—The loss at the Ohio Falls bridge was reported by the owners of the vessel; all other losses during the year were reported by Mr. J. Frank Tilley, secretary of the Pittsburg Coal Exchange.

*Losses by collision with Ohio River bridges to December 31, 1902.*

Ohio Connecting Railway bridge.....	\$3,500.00
Beaver bridge.....	73,740.00
East Liverpool bridge.....	1,500.00
Steubenville bridge.....	122,358.00
Wheeling and Martins Ferry bridge.....	12,150.00
Bellaire bridge.....	150,128.00
Parkersburg bridge.....	110,348.47
Point Pleasant bridge.....	9,650.00
Kenova bridge.....	64,450.00
Newport and Cincinnati bridge.....	48,107.00
Covington and Cincinnati bridge.....	93,300.00
Chesapeake and Ohio bridge.....	2,400.00
Cincinnati Southern bridge.....	14,812.00
Louisville and Jeffersonville bridge.....	7,800.00
Ohio Falls bridge.....	202,050.00
Kentucky and Indiana bridge.....	34,267.00
Henderson bridge.....	37,160.00
Cairo bridge.....	32,419.95
Total.....	1,020,138.42

*General packet commerce of Ohio River in 1902.*

[Compiled from reports made by owners, agents, and masters of vessels and transportation companies, in compliance with act of Congress approved February 21, 1891.—Public, No. 92.]

Name of boat or company.	Terminal points.	Distance.	In commission.	Freight.	Passengers.
		Miles.	Mos.	Tons.	
Monongahela River Consolidated Coal and Coke Co.	Pittsburg to Cairo.....	965	12	a 3,316,280	.....
Do.....	do.....	965	12	b 130,000	.....
Steamer Argand.....	do.....	965	10	.....	12,000
C. Jutte & Co.....	do.....	965	12	265,000	.....
John F. Klein.....	do.....	965	10	81,500	65,530
Steamer Reba Reeves.....	Pittsburg to Louisville.....	598.5	9	52,500	.....
T. J. Hall.....	do.....	598.5	7	100,000	.....
Pittsburg and Cincinnati Packet Line.	Pittsburg to Cincinnati.....	468	7.5	51,234	27,841
Steamer Frank Gilmore.....	do.....	468	12	5,920	.....
Steamer Lookout.....	do.....	468	6	13,474	.....
Steamer Nellie England.....	do.....	468	11	152,500	200
Green & Hughes.....	Pittsburg to Huntington.....	308	9	14,800	11,747
Steamer Kanawha.....	Pittsburg to Gallipolis.....	289	9	14,400	12,600
Steamer Ben Hur.....	Pittsburg to Parkersburg.....	184	7	49,496	8,338
Steamer Lorena.....	Pittsburg to Marietta.....	171	7	10,700	7,800
Steamer Lee H. Brooks.....	Pittsburg to Bellaire.....	94	1	3,000	.....
Sharpsburg Sand Co.....	Pittsburg to Mingo.....	71	10	249,000	.....
Steamer Francis J. Torrance.....	Pittsburg to Economy.....	17	4	.....	60,000
Steamer Florence Belle.....	Pittsburg to Sewickley.....	11.5	4	10,000	20,000
Steamer Eliza.....	Pittsburg to Lowrie bar.....	6	5	60,000	.....
Iron City Sand Co.....	Pittsburg to Davis Island Dam.....	5	12	188,376	.....
Steamer D. T. Watson.....	do.....	5	.....	90,000	.....
Steamer Steel Queen.....	Pittsburg to McKees Rocks.....	3	12	2,841	576,548
Steamer Ella B.....	Toronto to Zallia.....	1	10	.....	46,418

a Coal.

b Iron and steel manufactured products.

## 1636 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

## General packet commerce of Ohio River in 1902—Continued.

Name of boat or company.	Terminal points.	Dis- tance.	In com- mis- sion.	Freight.	Passen- gers.
		Miles.	Mos.	Tons.	
Steamer T. M. Bayne	Steubenville to Wheeling	22.5	8	6,655	9,891
Steamer Nathaniel	Steubenville to opposite shore	1	10		16,525
Steamer West End	Brilliant to Wellsburg	1	11	1,000	68,000
Steamer Lizzie Townsend	Martins Ferry to Bellaire	5	10	65,821	
Steamer Conveyor	Martins Ferry to Wheeling	1.5	10		10,000
New Haven Towboat Co.	Wheeling to Cincinnati	378	9	71,200	
Steamer Excel	Wheeling to Middleport	161	3	2,500	2,500
Steamer H. K. Bedford	Wheeling to Parkersburg	94		9,200	6,727
Steamer Miles H.	do	94	3	5,000	
Steamer Jewel	Wheeling to Newport	68	9	4,500	10,000
Steamer Ruth	Wheeling to Sistersville	47.5	8.5	8,900	32,100
Steamer Big Sandy	Wheeling to Clarington	27.5	2	1,431	1,086
Steamer Leroy	do	27.5	8	1,737	12,168
Steamer Buckeye	Wheeling to Bellaire	3	11	32,810	26,815
Steamer Charon	Bellaire to Benwood	1	11		332,733
Steamer T. N. Barnsdall	Sistersville to Marietta	34	8	12,315	32,326
Steamer Orion	Sistersville to Tuels Landing	1	11	75,000	35,000
Steamer Grace Virginia	New Matamoras to Friendly	1	12		14,650
Steamer Hazel Rice	Marietta to Parkersburg	13	1	750	
Steamer Nellie Bartlett	Marietta to Williamstown	1	12	8,374	
Steamer Pioneer City	do	1	12	64,240	71,735
Steamer Venus	Parkersburg to Louisville	414	9	30,400	2,4
Steamer Nina Paden	Parkersburg to Belpre	1	11	20,000	110,000
Steamer W. O. Hughart	Graham Station to Racine	1	9	8,950	13,500
Steamer Bill Clark	Syracuse to Louisville	364	8	125,000	
Syracuse Coal and Salt Co.	Syracuse to Cincinnati	224	8	189,485	
Steamer Klondike	Syracuse to Gallipolis	24	9	8,000	9,560
Huntington and St. Louis Towboat Co.	Pomeroy to Cairo	716	12	206,500	
Convoy Towboat Co.	Pomeroy to Louisville	349		96,690	
Big Sandy Towboat Co.	do	349	10	94,450	
Cincinnati, Portsmouth, Big Sandy and Pomeroy Packet Co.	Pomeroy to Cincinnati	219	11	88,453	37,930
Collins & Hartweg Co.	do	219	8	188,400	
Steamer Champion No. 3	Pomeroy to Mason City	1	12	4,000	75,000
Kanawha and Ohio Co.	Point Pleasant to Louisville	334	10	330,470	
Steamer Mildred	do	334	5	60,000	
Steamer Otto Marmet	do	334	12	77,000	
Marmet Co.	Point Pleasant to Cincinnati	204	12	208,635	
Steamer Katie Mc.	do	204	6	67,100	4,000
Steamer Nova	Point Pleasant to Gallipolis	5	12	10,000	1,600
Steamer Maxie Yost	Gallipolis to Huntington	39	1	837	561
Steamer Carrie Brown	do	39	10.5	40,950	31,185
Steamer Champion No. 2	Gallipolis to Gallipolis Ferry	1	12	6,000	16,109
Steamer Catherine Davis	Guyandotte to Louisville	294	5	7,560	
C. Crane & Co.	do	294	12	440,000	
Steamer F. A. Goebel	Guyandotte to North Bend	180	9	106,000	
Steamer Greyhound	Proctorville to Portsmouth	51	11	14,300	25,740
Steamer Arion	Proctorville to Guyandotte	1	10	12,000	15,000
Steamer Lucy Coles	Ashland to Portsmouth	33	9	9,407	
Steamer Bob Ballard	Ashland to Ironton	5	12	428,650	
Steamer Wenona	Ashland to Coal Grove	1	12		73,000
Steamer Ironton	Ironton to Russell	1	12	13,467	119,291
Steamer B. F. Bennett	Portsmouth to Fullerton	2	9.5	400	8,000
Buena Vista Freestone Co.	Buena Vista to opposite shore	1		4,000	
Steamer W. H. Whiteman	Manchester to South Man- chester	1	12	5,770	52,814
Steamer Laurance	Maysville to Aberdeen	1	12	10,000	27,064
Steamer Proctor K. Smiley	Ripley to South Ripley	1	12	4,535	20,940
Steamer Whisper	Augusta to Bonds Ferry	1	12	58,900	24,140
B. J. Riggs	Moscow to North Bend	43	12	83,090	56
Steamer New Richmond	New Richmond to South New Richmond	1	12	2,400	38,400
Coney Island Co.	Coney Island to Cincinnati and excursions	9	5	700	724,888
Smith Coal and Sand Co.	Dayton to Addyston	16	12	225,400	
Steamer Avalon	Cincinnati to Cairo	498	4	3,600	1,400
John Barrett & Son	do	498	8	47,000	
A. Montgomery & Co.	do	498	3.5	51,250	
Memphis and Cincinnati Packet Co.	do	498	8	8,977	2,462
New Orleans and Cincinnati Packet Co.	do	498	5	15,681	1,635
Steamer E. T. Slider	Cincinnati to Evansville	316	12	88,125	
Steamer City of Wheeling	Cincinnati to Louisville	130	5	10,125	8,000
Louisville and Cincinnati Packet Co.	do	130	12	135,481	111,053
Steamer Levi J. Workum	Cincinnati to Madison	85	10	24,000	12,812
Steamer Golden Gate	do	85	5	10,413	4,122
Steamer Boone No. 5	Constance to Riverside	1	12	23,725	8,600



*General packet commerce of Ohio River in 1902—Continued.*

Name of boat or company.	Terminal points.	Dis- tance.	In com- mis- sion.	Freight.	Passen- gers.
		Miles.	Mos.	Tons.	
Steamer Swan.....	Aurora to Patriot.....	21	9	90	5,802
Steamer Minnie.....	Vevay to Rockport.....	207	12	7,500	300
Steamer Eva Evartt.....	Vevay to Ghent.....	1	12	150	17,128
Louisville and Jeffersonville Ferry Co.....	Carrollton to Leavenworth.....	117	3	-----	208,678
Steamer Falls City.....	Carrollton to Louisville.....	57	10	17,312	5,472
Steamer Trimble.....	Madison to Milton.....	1	12	-----	8,975
Steamer Alma.....	Louisville to Cairo.....	367	10	16,111	3,100
The Marsden Co.....	do.....	367	12	23,475	36,276
Louisville and Evansville Packet Co.....	Louisville to Henderson.....	190	11	185,261	26,544
Steamer Little Willie.....	Louisville to Evansville.....	185	12	36,295	-----
Steamer Rush.....	Louisville to New Albany.....	5	12	-----	3,798
Louisville and Jeffersonville Ferry Co.....	Louisville to Jeffersonville.....	1	12	-----	711,875
W. D. Crammond.....	Cannelton to Owensboro.....	32	7	5,430	31,800
Steamer Lulu E. Warren.....	Tell City to Paducah.....	200	4	6,000	400
Dan Finnie.....	Owensboro to Cairo.....	216	-----	820,500	-----
Robert Hornbrook.....	Owensboro to Paducah.....	171	12	46,026	11,359
Steamer Wabash.....	do.....	171	8	20,000	6,000
Archbold Coal Co.....	Owensboro to Mount Vernon.....	70	12	31,500	-----
Steamer Henderson.....	Newburg to Uniontown.....	63	12	1,800	5,440
Steamer Pilot.....	Mouth Green River to Casey- ville.....	87	9	8,000	-----
Evansville and Bowling Green Packet Co.....	Mouth Green River to Evans- ville.....	8	12	43,650	15,772
Steamer Edgar.....	do.....	8	11	53,880	-----
Green River Mining Co.....	do.....	8	9	21,136	-----
Steamer Old Reliable.....	do.....	8	12	13,700	-----
Steamer Peter Hontz.....	do.....	8	10	20,000	300
Steamer John F. Buckham.....	Evansville to Cairo.....	182	11	12,402	700
Steamer Wm. Towle.....	do.....	182	12	130,500	-----
Steamer Ruth.....	do.....	182	10	23,400	-----
Evansville, Paducah and Cairo Line.....	Evansville to Paducah.....	137	12	32,293	28,819
Nashville and Evansville Packet Co.....	Evansville to Smithland.....	125	5	10,000	3,000
Steamer New Haven.....	Evansville to mouth Wabash River.....	65	4.5	980	-----
Steamer Jewell.....	Evansville to Henderson.....	11	12	50,000	70,000
Illinois Central Railway Co.....	Majors to McClain.....	1	8	227,014	33,784
Steamer Racket.....	Henderson to Paducah.....	128	12	15,000	-----
Steamer Alfred D. Owen.....	West Franklin to Uniontown.....	25	12	8,767	9,720
Steamer Georgie.....	Shawneetown to opposite shore.....	1	6	1,248	6,240
Steamer Nellie Brown.....	Dekoven to Paducah.....	62	12	26,833	-----
Paducah Coal and Mining Co.....	Caseyville to Cairo.....	105	10	116,000	-----
Steamer Woolfolk.....	do.....	105	-----	60,000	-----
Steamer Monie Bauer.....	do.....	105	12	50,000	-----
Ayer and Lord Tie Co.....	Weeton to Cairo.....	100	9	176,900	-----
Steamer Mary Stewart.....	Elizabethtown to Paducah.....	43	9	3,649	2,144
Steamer Key City.....	Golconda to Paducah.....	30	10	250	-----
Steamer J. M. Howell.....	Smithland to Mound City.....	51	6	9,874	-----
Steamer Lyda.....	Smithland to Joppa.....	28	11	51,000	-----
Steamer Mary N.....	Smithland to Paducah.....	12	12	175,000	-----
Steamer Dick Fowler.....	Paducah to Cairo.....	45	12	22,550	42,500
St. Louis and Tennessee River Packet Co.....	do.....	45	12	105,200	11,140
Steamer Ten Broeck.....	do.....	45	12	72,500	-----
O. F. Keeler & Sons.....	do.....	45	8	434,000	-----
Steamer Leo.....	Paducah to Joppa.....	16	8	156,150	-----
Aberdeen Coal and Mining Co.....	do.....	16	12	60,240	-----
Steamer Geo. H. Cowling.....	Paducah to Metropolis.....	9	12	4,040	37,375
Illinois Central Railway Co.....	Paducah to Brookport.....	3	12	366,241	24,908
Total.....				12,202,017	4,517,635

# 1638 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

## Coal shipments from Pittsburg, Pa.

[Furnished by J. Frank Tilley.]

Month, 1902.	To Cincinnati				To Louisville.			
	Trips.	Coal boats.	Coal barges.	Tons.	Trips.	Coal boats.	Coal barges.	Tons.
January.....	7	28	61	60,940	12	109	95	160,300
February.....	2	4	39	25,060	5	31	29	46,690
March.....	11	84	118	147,720	33	272	186	372,440
April.....	9	42	119	106,260	26	189	202	298,080
May.....	3	—	35	18,900	3	—	46	24,840
June.....	3	6	49	32,460	2	6	42	28,680
July.....	38	237	336	418,440	55	428	456	674,240
August.....	2	—	36	19,440	—	—	—	—
October.....	14	42	172	134,880	8	5	128	74,120
November.....	14	24	203	133,620	3	11	53	39,620
December.....	22	209	107	206,780	26	332	138	406,520
Total.....	125	676	1,275	1,364,500	173	1,383	1,375	2,125,500

Total amount of coal shipped from Pittsburg to Cincinnati and Louisville ..... tons.. 3,490,000  
Add 848 flats of 200 tons each, not included in above .....do..... 169,600

Total ..... 3,659,600

NOTE.—No shipments to Cincinnati or Louisville in September. July, 1902, was a record-breaking month in the entire history of the coal trade, and a study of the table above will show what continuous navigation on the Ohio River means even under present conditions, it being perhaps the only month on record, winter or summer, when coal shipments could be made almost any day in the month.

Trips above mentioned are determined as to Cincinnati or Louisville (a) by an entire tow going to either place, and (b) when the tow was divided at Cincinnati the trip was given to the city to which the bulk of the tow went.

In addition to coal shipments, Pittsburg towboats towed barges to Louisville and points below loaded with steel rails and iron and steel manufactured products containing 130,000 tons.

Craft are based on coal boats of 1,000 tons each and barges of 540 tons.

REPORT OF MR. R. R. JONES, CHIEF ASSISTANT ENGINEER, ON REMOVING ROCK BAR AT MOUTH OF LICKING RIVER, KENTUCKY (468.4 MILES BELOW PITTSBURG; SURVEYS 1896-1900).

UNITED STATES ENGINEER OFFICE,  
Cincinnati, Ohio, June 30, 1903.

COLONEL: I have the honor to submit the following report of operations in removing rock bar at mouth of Licking River for the fiscal year ending June 30, 1903:

The work was carried on, as during the preceding year, by submarine drilling and blasting with Government plant and hired labor, and with dredge boat, towboat, and barges, hired under contract by the day.

The work was considerably interfered with by high water during the month of July, 1902, but as the stage of river dropped the work went on smoothly and successfully until suspended for the season on December 10.

During the fiscal year ending June 30, 1903, 4,564 cubic yards of solid rock were drilled and blasted, and 28,121 cubic yards of blasted rock, loose rock, gravel, and sand were dredged from the channel and deposited behind the dike at Culloms Ripple, just below Cincinnati.

The addition of a third steam drill had so greatly facilitated the operation of the drill boat that the work accomplished during the season was by far the largest of any year since the inauguration of the work.

The southwest half of the channel has been blasted and dredged to a depth of 4 feet at low water for its entire length, and the northwest half has been blasted and dredged for nearly one-half its length.

Tabulated statements of work done and cost of same are appended hereto.

# APPENDIX F F—REPORT OF COLONEL LYDECKER. 1639

*Statement of solid rock blasted by use of steam drills and submarine charges since this method was first adopted.*

Fiscal year ending June 30—	Cubic yards.
1894 .....	892.2
1895 .....	2,082.68
1896 .....	2,736
1902 .....	2,572
1903 .....	4,564
<b>Total</b> .....	<b>12,846.88</b>

*Statement of the total material (solid rock, loose rock, gravel, and sand) removed since the work was first undertaken.*

	Cubic yards.
By open cut in cofferdam, fiscal years ending June 30, 1888 and 1892 .....	3,619.6
By blasting solid rock and by dredging the rock, gravel, and sand, fiscal years ending June 30, 1894, 1895, 1896, and 1902 .....	36,429.1
By blasting solid rock and by dredging the rock, gravel, and sand, fiscal year ending June 30, 1903 .....	28,121
<b>Total</b> .....	<b>68,169.7</b>

## *Summary of holes drilled, etc.*

Fiscal year ending June 30—	Number of holes drilled and blasted.	Total depth.
		<i>Feet.</i>
1894 .....	832	2,441.6
1895 .....	1,194	4,859.9
1896 .....	1,958	7,212.3
1902 .....	1,259	5,020
1903 .....	3,684	12,675
<b>Total</b> .....	<b>8,967</b>	<b>32,208.8</b>

<sup>a</sup> Equivalent to 6.1 miles.

Average depth of hole. 3.6000 feet.

The cost of the work during the fiscal year, exclusive of inspection, office expenses, etc., was \$3.23 per cubic yard.

## *Comparative statement of cost.*

Lowest proposal (October 31, 1901) .....	\$3.82
Cost during season of 1901 .....	3.35
Cost during season of 1902 .....	3.23

## *Various items of cost for fiscal year ending June 30, 1903.*

	Quantity.	Value.
Dynamite:		
No. 1 .....	pounds.. 2,050	\$1,208.75
No. 2 .....	do. 6,775	
Exploders, insulated .....	number 3,000	684.43
Muslin for wrappers .....	yards 419	25.17
Twine for making up cartridges .....	pounds 53	10.60
Rubber tubing for insulating joints .....	feet 800	24.00
Connecting and leading wire .....	pounds 284	21.38
<b>Total explosives, etc.</b> .....		<b>1,974.33</b>
Fuel .....		115.00
Repairs .....		2,805.50
Supplies, including rope, oil, fittings, etc .....		527.52
Expense, including towing, wharfage, travel, etc .....		161.00
Labor and inspection .....		4,100.88
<b>Total</b> .....		<b>9,683.83</b>
Cost per cubic yard rock drilled and blasted .....		<b>2.12</b>

# 1640 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

*Cost of dredging, including towing and unloading, fiscal year ending June 30, 1903.*

Dredge, hired under proposals .....	\$3,062.76
Flatboats, hired under proposals .....	5,747.50
Towboat, hired under proposals .....	5,806.32
Labor, unloading dredged material .....	2,409.77
Inspection and miscellaneous expense .....	1,982.87
Total .....	<u>24,009.22</u>
Cost per cubic yard dredging, etc .....	.85

It will be noted that notwithstanding the unfavorable conditions which prevailed during the early part of the season the total cost of drilling, blasting, and dredging was reduced 12 cents per cubic yard over the season of 1901, and was 59 cents per cubic yard less than the lowest bid for doing the work under proposal of October 31, 1901.

Under ordinarily favorable conditions the cost will be still further reduced during the coming season, and it is expected that the channel, as originally proposed, will have been practically cleared before the close of the fiscal year ending June 30, 1904.

The work has been under the immediate supervision of Mr. Clinton B. Harris, junior engineer, assisted by Mr. Frank C. Stout, inspector, on the second or night turn at dredging.

Respectfully submitted.

R. R. JONES,  
*Chief Assistant Engineer.*

Col. G. J. LYDECKER,  
*Corps of Engineers.*

## REPORT OF MR. R. R. JONES, CHIEF ASSISTANT ENGINEER, ON DIKE NEAR MOUTH OF TRADEWATER RIVER.

UNITED STATES ENGINEER OFFICE,  
*Cincinnati, Ohio, June 30, 1903.*

COLONEL: I have the honor to submit herewith a report of operations in construction of a dike near the mouth of Tradewater River, below Caseyville, Ky. for the fiscal year ending June 30, 1903.

Work on this dike was completed during the fiscal year ending June 30, 1902, with the exception of filling a 200-foot opening, which had been purposely left at a point where the old steamboat channel crossed the line of the dike.

Careful examinations of the channel during the season of 1901-2 having shown the importance of entirely closing this gap, proposals for furnishing stone in place in the dike were invited under public notice, dated August 19, 1902. The prices named in proposals received were so high that all bids were rejected, and stone purchased in the open market at prices ranging from 50 cents to \$1 per cubic yard less than those named in bids.

Work was begun August 29 and completed November 29, 1902. The channel opening was entirely filled and the lower slope, opposite the former opening, reenforced with loose stone.

The material placed in dike during the fiscal year ending June 30, 1903, was as follows:

Stone, larger class (6 to 10 cubic feet) .....	cubic yards..	496.545
Stone, smaller class ( $\frac{1}{4}$ to $1\frac{1}{2}$ cubic feet) .....	do .....	<u>3,459.340</u>
Cost:		
496.545 cubic yards, at \$3 .....		\$1,489.64
3,459.340 cubic yards, at \$1.50 .....		<u>5,189.01</u>
Total .....		6,678.65

The work was done under the immediate supervision of Mr. C. W. Lewis, inspector.

The construction of the dike has materially improved the channel opposite same, but it is probable that additional works will be required to prevent the waste of water into the old back channel behind Tradewater Towhead.

Respectfully submitted.

R. R. JONES,  
*Chief Assistant Engineer.*

Col. G. J. LYDECKER,  
*Corps of Engineers.*

APPENDIX F F—REPORT OF COLONEL LYDECKER. 1641

REPORT OF MR. R. R. JONES, CHIEF ASSISTANT ENGINEER, ON THE CONSTRUCTION  
AND REBUILDING OF ICE PIERS IN THE OHIO RIVER.

UNITED STATES ENGINEER OFFICE,  
*Cincinnati, Ohio, June 30, 1903.*

COLONEL: I have the honor to submit the following report in connection with the construction and rebuilding of certain ice piers in the Ohio River for the fiscal year ending June 30, 1903:

MAYSVILLE, KY.

The project for the construction of an ice pier at Maysville, Ky., 407.4 miles below Pittsburg, was submitted July 9 and approved July 28, 1902.

During the month of August, 1902, a preliminary survey of the locality was made, including soundings and borings, to determine the nature of the bed of the river at a point selected as being the most favorable for the location of the pier.

After having determined upon the location, efforts were made to procure the necessary relinquishment of riparian rights at and below the site of proposed pier. The relinquishments of three of the owners of abutting property were secured without difficulty, but up to the present time the relinquishment of riparian rights has not been obtained from the owner of another piece of property involved, and the construction of the ice pier has been delayed on this account.

HOCKINGPORT, OHIO.

The project for constructing an ice pier at or near the mouth of Big Hocking River, about 198.6 miles below Pittsburg, was submitted July 8 and approved July 31, 1902.

During the month of August, 1902, a survey, including soundings of the river in the vicinity and borings to determine the nature of the bed of the river, was made. A suitable location for the ice pier was determined upon and the necessary relinquishment of riparian rights obtained.

During the month of June the necessary machinery to be used during construction has been purchased and is now being set up in position at the site of the proposed pier. Contracts have been awarded for the various materials required, such as stone, cement, iron, steel, timber for forms, etc. A temporary building has been erected for the storage of cement, tools, etc., and the work of preparing timber forms for the concrete construction is now in progress. It is proposed to begin the work of actual construction as soon as the river reaches a favorable stage, and the work will be carried on by the United States with hired labor and the plant now being installed on the ground.

MIDDLEPORT AND GALLIPOLIS, OHIO.

The project for rebuilding the ice piers in the Ohio River at Middleport and Gallipolis, Ohio, was submitted July 8 and approved July 21, 1902.

It is expected to begin this work during the present season if the conditions are favorable.

Respectfully submitted.

R. R. JONES,  
*Chief Assistant Engineer.*

Col. G. J. LYDECKER,  
*Corps of Engineers.*

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REPORT OF MR. E. J. CARPENTER, ASSISTANT ENGINEER, ON WORK OF THE OHIO  
RIVER DREDGES DURING THE CALENDAR YEAR 1902.

UNITED STATES ENGINEER OFFICE,  
*Cincinnati, Ohio, June 30, 1903.*

COLONEL: I have the honor to submit the annual report of operations of United States dredges *Ohio* and *Oswego* for the calendar year 1902, with tabular statements showing cost, amount of excavation, etc.; and also report of operations of hired dredging plant, with similar tabular statement.

As there was no money available for dredging except at and below Evansville, Ind., where the river was too high for work during the early part of the season,

## 1642 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY

the dredges remained in their winter quarters at Paducah, Ky., until after the new appropriation was made. They were then brought to Cincinnati, and repairs necessary to fit the plant for operation were completed on August 22.

### FIVE MILE BAR, 455 MILES BELOW PITTSBURG.

Improvement of this bar, one of the worst obstructions to navigation in the vicinity of Cincinnati, was begun in 1895 by dredging in connection with the construction of low riprap dikes, one on the Kentucky side of the channel and two on the Ohio side, the dikes being built of material excavated during improvements at this and other points; but the work was interrupted before the first cut through the bar was completed and before any but the Kentucky dike had been built up to low-water level.

Completion of this improvement being included in the project for dredging in 1902, the United States dredges began work there on August 25 and continued until stopped by high water late in November.

The obstruction in the channel line was a bar containing cemented gravel with many large bowlders, backed with gravel and sand, a considerable part of the cemented gravel being so hard that the dredges found its removal difficult, even after it had been repeatedly blasted with dynamite. Much of the work was done during a very low stage of river, which made access to the dumping ground difficult and necessitated hiring an additional tender to help tow the scows; and this, together with delays incident to the removal of large rocks and to blasting, materially reduced the rate of excavation and increased its cost.

As it was desirable to open the channel with the least possible delay, the Sheridan-Kirk dredging plant, hired under emergency contract dated August 21, 1902, was operated at this place in connection with the Government dredges, but as the hired plant had not sufficient power to remove the hard material it was employed mainly on the gravel and sand excavation at the lower end of the bar.

The channel dredged is about 3,400 feet long, 6 feet deep at low water, and 210 feet wide except for a distance of about 600 feet through the high part of the bar, where its width is from 190 to 200 feet. The excavated material was dumped, as far as possible, on the shores opposite and above the bar, where it serves to aid the dikes in directing the current into the new channel.

#### *Excavation made by United States dredges August 25 to November 28.*

Cemented gravel, bowlders, and sand.....	cubic yards..	76,166
Rocks removed .....	{ number..	52
	{ tons.....	189

The work was stopped by a general rise of the river on November 28, and as there was no prospect of being able to resume operations before winter the plant was taken to the Kentucky River at Carrollton and laid up, after which the crews, with exception of one engineman and one cranesman left to care for the plant, were sent to Cincinnati and furloughed without pay.

Since the end of the calendar year, and prior to the end of the fiscal year—that is, from January 1 to June 30, 1903—the operations of the Government dredging fleet were, briefly, as follows:

The dredges remained in winter quarters in the Kentucky River at Carrollton until April 12, when they were brought to Cincinnati to fit them for the season's work, the principal items of repairs needed being as follows:

*On the Ohio.*—Repairs of broken main engine housing, general overhauling of machinery, and new hoisting ropes for forward spuds.

*On the Oswego.*—New boiler, general refitting of machinery, 3 new roof plates, and new casting for support of the crane.

The four dump scows were found to be so badly rotted that repairs to fit them for the season's work necessitated practical rebuilding of nearly one-half of the bins, decks, and sides, and this work proved so much more extensive than expected that the plant could not be made ready for work until June 15.

On completion of the repairs the plant proceeded to Buena Vista, Ohio, where it has since been engaged in improving the channel at Twin Creek bar, where 4,345 cubic yards of material was excavated up to June 30, 1903. On June 26 the dredge *Ohio* broke up and removed a loaded coal barge sunk in the channel at Manchester Island, 21 miles below Twin Creek bar, in order to allow passage of descending coal boats.

# APPENDIX F F—REPORT OF COLONEL LYDECKER. 1643

## WORK OF HIRED DREDGING PLANT IN 1902.

Under proposals opened August 15 an emergency contract was made with the Sheridan-Kirk Contract Company to furnish a dredging plant consisting of 1 dipper dredge, 3 dump scows, and 1 towboat for tender, with crews, fuel, and all necessary appliances.

The plant was operated at Five-Mile bar in connection with the United States dredges, but worked sixteen hours per day with double crews. The plant was employed mainly in removing sand and gravel at the lower end of the bar, not having power to excavate the harder material.

Description of the work on which hired plant was engaged is given in report of operation of the United States dredges for 1902.

Beginning on August 25, the plant was employed until November 29, when work was stopped for the season and the plant was discharged.

### Excavation made August 25 to November 28.

Sand, gravel, etc .....	cubic yards..	43,949
Rocks removed .....	{number..	5
	{tons .....	10.7

Respectfully submitted.

E. J. CARPENTER,  
Assistant Engineer.

Col. G. J. LYDECKER,  
Corps of Engineers.

## OHIO RIVER DREDGING STATEMENT FOR 1902.

### Dredges in commission.

#### TIME.

Time at work.	Days.	Time lost.	Days.
Dredging sand, cemented gravel, bowlders, etc .....	54.6	Sundays .....	15.0
Removing rocks .....	2.2	Holidays .....	2.0
		Travelling .....	1.0
		High water .....	8.0
		Low water .....	1.6
		Coaling .....	4.0
		Accidents .....	19.6
Total .....	56.8	Total .....	51.2

Total in commission, 106 days.

#### WORK.

Nature of work.	Per day of work.	During the season.
	<i>Cu. yds.</i>	<i>Cu. yds.</i>
Sand, cemented gravel, bowlders, etc., excavated .....	1,335	76,166
Total excavation for the season .....		76,166
	<i>Number.</i>	<i>Tons.</i>
Rocks removed .....	52	189

#### COST.

Equipment for the season .....	\$1,692.45
Towing and fuel for the season .....	5,833.06
Repairs for the season .....	1,040.20
Salaries for the season .....	5,291.40
Total for the season .....	13,787.11

# 1644 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

## Dredges out of commission.

TIME.		Days
In ordinary	.....	310
Annual repairs	.....	47
Total	.....	357
COST.		
Salaries in ordinary	.....	\$3,713.78
Towing and fuel in ordinary	.....	826.62
Total in ordinary	.....	\$4,540.40
Salaries during annual repairs	.....	3,213.59
Annual repairs (shop bills, materials, etc.)	.....	2,417.17
Total cost of repairs	.....	5,630.76
Total out of commission	.....	10,171.16
Cost per day in ordinary (including superintendent's pay)	.....	21.62
<i>Cost of work, including all expenditures, in 1902.</i>		
Dredging sand, cemented gravel, bowlders, etc	.....	\$23,030.30
Removing rocks	.....	927.97
Total expenditure in 1902	.....	23,958.27
<i>Cost per unit.</i>		
Per cubic yard of excavation	.....	\$0.302

The day of work is eight hours actual operation of 2 dredges with 4 dump scows and 1 towboat for tender, making good every hour lost by accident or otherwise.

The towboat *Catherine Davis*, chartered as dredge tender, was paid \$49.50 per day, this amount covering the cost of the boat, with outfit, crew, and fuel for the towboat and dredges, except that all cost of coal in excess of 5 cents per bushel was repaid by the Government.

The expenditure for towing includes \$680 for hire of additional dredge tenders found necessary to dispose of the excavated material when a low stage of river prevented access to the near dumping grounds.

The "total expenditure," on which the cost of work is based, covers all outlay properly applicable to the season of 1902, including the cost of superintendence, office work, etc.

## Location and description of work.

Place.	Miles from Pittsburg.	Date, 1902.	Days of work.	Rocks.		Sand, cemented gravel, bowlders, etc.	Per day of work.	Cost per cubic yard.	Total for 1902.
				No.	Tons.				
Five Mile bar	455	Aug. 25-Nov. 23	54.6			<i>Cu. yds.</i> 78,166	<i>Cu. yds.</i> 1,305	\$0.302	\$23,030.30
Do	455	Aug. 25-Nov. 19	2.2	52	189				927.97
Total			56.8	52	189	78,166			23,958.27

## Work of hired dredging plant, under emergency contract with Sheridan-Kirk Contract Company, dated August 21, 1902.

Place.	Miles from Pittsburg.	Date.	Days of work.	Rocks.		Sand, gravel, etc.	Per day of work.	Cost per cubic yard.	Total for 1902.
				No.	Tons.				
		1902.				<i>Cu. yds.</i>	<i>Cu. yds.</i>		
Five Mile bar	455	Aug. 25-Nov. 23	119.0			43,949	369.3	\$0.306	\$11,641.71
Do	455	Sept. 4-Nov. 23	.9	5	10.7				88.75
Total			119.9	5	10.7	43,949			11,730.46



## FF 2.

## CONSTRUCTION OF LOCK AND DAM NO. 37, OHIO RIVER.

The general project for this work is printed in House Document No. 336, Fifty-seventh Congress, first session, and it was adopted by Congress in the river and harbor act of June 13, 1902, by appropriating \$100,000 for commencing operations and authorizing their completion under the continuing contract system at a total cost not exceeding \$1,050,000.

Operations during the last fiscal year were limited to local surveys and critical examinations of the bed of the river that resulted in finding an exceptionally satisfactory site at Fernbank, Ohio, 12.7 miles below the Cincinnati Suspension Bridge, where a good rock foundation was disclosed by the borings at an average depth of 12.9 feet below low water for the dam and of 9.7 feet for the lock. The parcels of land required for the improvement have been surveyed and platted, and steps for their purchase or condemnation were being taken at the close of the fiscal year. In the meantime good progress has been made on the preparation of detailed plans and specifications, and they will be completed by the time that the necessary lands come into possession of the Government.

These operations were carried on under the supervision of Chief Assistant Engineer R. R. Jones, and his report in relation to them is herewith.

*Money statement.*

July 1, 1902, balance unexpended .....	\$100,000.00
Amount appropriated by sundry civil act approved March 3, 1903 .....	400,000.00
	<hr/> 500,000.00
June 30, 1903, amount expended during fiscal year .....	12,127.06
	<hr/>
July 1, 1903, balance unexpended .....	487,872.94
July 1, 1903, outstanding liabilities .....	250.00
	<hr/>
July 1, 1903, balance available .....	487,622.94
	<hr/>
{ Amount (estimated) required for completion of existing project .....	550,000.00
{ Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903 .....	250,000.00
{ Submitted in compliance with requirements of sundry civil act of June 4, 1897.	

## STATEMENT OF AMOUNTS AND DATES OF ALL APPROPRIATIONS FOR THIS WORK.

Act of Congress—	
June 13, 1902 .....	\$100,000
March 3, 1903 .....	400,000
	<hr/>
Total .....	500,000

## LIST OF CONTRACTS IN FORCE DURING THE FISCAL YEAR ENDING JUNE 30, 1903.

*Emergency contracts.*

*Borings.*—George W. Icenhower, August 20, 1902; commence within ten days after receipt of order; terminate when discharged; discharged December 18, 1902.

# 1646 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

REPORT OF MR. R. R. JONES, CHIEF ASSISTANT ENGINEER, ON LOCATION OF SITE FOR DAM NO. 37, OHIO RIVER.

UNITED STATES ENGINEER OFFICE,  
Cincinnati, Ohio, June 30, 1903.

COLONEL: I have the honor to report on location of Dam No. 37, Ohio River, as follows:

*Preliminary examination.*—Three localities were tentatively selected as promising from superficial examination to afford favorable sites for proposed Lock and Dam No. 37. These three localities have been explored by test borings through the overlying sand and gravel in order to determine the position of the rock, and borings have been made into the rock itself sufficiently to determine its character.

The three general localities thus explored are shown on sketch map herewith, as follows:

Locality.	Miles below Pittsburg.
(A) Home City and Fernbank, Ohio .....	481.5
(B) North Bend, Ohio .....	484.5
(C) Medoc Bar, Ohio and Kentucky .....	487.5

The result of the preliminary borings was to show the rock at localities B and C lying at maximum depths (52 to 67 feet), which was very unfavorable for economical construction. Besides this disadvantage, the trend of the river channel was such as to render approach to and egress from the lock somewhat unfavorable at localities B and C. Locality A, on the other hand, showed from the first favorable conditions as regards rock at economic depths, easy approach to navigable pass and lock, and a natural pool of good depth extending for 6 miles below the lock.

The general advantages of locality A having been demonstrated, a more extended examination was made at this point.

*Special borings.*—The preliminary borings at locality A had shown the existence of a reef of rock extending entirely across the Ohio River, but having a somewhat irregular outline. To definitely determine the elevation of the reef at different points, borings were made over a stretch of river about 4,100 feet in length, on lines of proposed axes of dam and lock walls. Test holes were sunk over this portion of the bar, and the general results of this examination are embodied in the drawings transmitted herewith. The total number of holes and the total linear feet drilled in each locality are also shown in the following table:

	Locality.			
	A	B	C	Total.
Holes drilled .....	106	25	19	150
Loose material drilled .....	1,408.37	749.91	1,053.63	3,211.91
Core drilled (rock) .....	63.68	27.16	15	105.84

## Rough comparison of depths to rock.

	Site (a).	Site (b).
DAM.		
Maximum depth of rock below low water .....	20.8	21.6
Average depth of rock below .....		
Low water .....	12.9	11.2
Sill Navigable Pass .....	9.4	7.7
Top of masonry .....	7.6	5.9
LOCK-RIVER WALL.		
Maximum depth of rock below low water .....	16.1	26.8
Average depth of rock below low water .....	11.2	18.2
LOCK-LAND WALL.		
Maximum depth of rock below low water .....	16.2	37.5
Average depth of rock below low water .....	7.3	24.7

It will be noted from above comparison that while site (b) is favorable for the dam proper the depth at which rock is found under the lock walls is such as to practically prohibit carrying the foundations down to rock. On the other hand, site (a) while somewhat less favorable for the dam proper is still practicable for masonry construction extending down to rock for the entire length of the dam, and under the lock walls, gate sills, and gate recesses the rock is everywhere found at a depth which enables all construction to rest upon solid foundation.

*Guiding walls.*—Considering the respective sites as affecting the guiding walls above and below the lock, site (a) has a very decided advantage over site (b).

*Character of rock.*—The rock formation universally found in this region consists of rather thin layers of limestone separated by strata of shale or soapstone. The borings made at all the localities named herein closely correspond in this respect, as do also the holes (nearly 9,000 in number) made through a similar formation of rock on bar at the mouth of Licking River during the progress of the blasting done at that point.

Drawings<sup>a</sup> are submitted herewith as follows:

Sheet No. 1: General sketch map of Ohio River, from Cincinnati to mouth of Big Miami River. Sheet No. 2: Locality A, cross-section river bed, site (a); cross-section river bed, site (b). Sheet No. 3: Localities B and C, cross-sections river bed.

The work of making the test borings has been in local charge of Mr. E. W. Buell, junior engineer. The borings were made between August 25, 1902, and May 11, 1903.

In conclusion, I have the honor to recommend that site (a), locality A, opposite the upper end of the corporation of Fernbank, Ohio, be adopted for the final position of Dam No. 37, Ohio River, provided by river and harbor act of June 13, 1902, and sundry civil act of March 3, 1903.

Respectfully submitted.

R. R. JONES, *Chief Assistant Engineer.*

Col. G. J. LYDECKER,  
*Corps of Engineers.*

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### F F 3.

#### OPERATING SNAG BOATS ON OHIO RIVER.

The act of Congress of September 19, 1890, as modified by that of June 3, 1896, provided for yearly appropriations of \$50,000 for this work. For phraseology of these acts and further details see the Annual Report for 1896, Part IV, page 2093.

At the commencement of the fiscal year the U. S. snag boat *E. A. Woodruff* was engaged in removing obstructions in Cincinnati Harbor, but left there July 5 and proceeded direct to Pittsburg, where she arrived on the 9th, and began to work down the river to Cairo, Ill., but after reaching Wheeling, W. Va., where the boat was delayed three days for temporary repairs to her smokestacks, she returned to remove a flatboat that had sunk in the meantime at a point about 79 miles above, and then again turning downstream the general removal of obstructions was continued to the mouth of the river, where the boat arrived August 16. Returning upriver the boat reached Cincinnati September 6, where she remained inactive on account of low water until October 7, when a temporary rise permitted her to steam up as far as Georgetown Island, 38 miles below Pittsburg, where she turned back and, clearing the channel en route as thoroughly as the falling stage would permit, reached Fletchers Landing, about 30 miles above the mouth of the river, on December 1. No obstructions being known or reported below that point, she returned upriver to Cincinnati, where she went into winter quarters December 15, when high

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<sup>a</sup> Not forwarded.

water and severe weather made it improbable that any further effective work could be accomplished.

The boat resumed active service May 7, 1903, when she steamed up as far as Steubenville, Ohio, 67 miles below Pittsburg, and worked back on a falling river down to Louisville, Ky.; then on a rising river again steamed upstream to within 10.5 miles of Pittsburg, when low water again made it necessary to fall back to Wheeling, W. Va., where information was received of heavy rains in the Allegheny and Monongahela districts on June 22, which assured a rapid rise to a coal-boating stage, and she therefore steamed to Pittsburg, remained there until June 26, and then followed the descending coal fleets to remove the wrecks which almost invariably occur during large coal shipments. In addition to snags and other wrecks, 2 barges sunk during this coal run had been removed up to June 30, the end of the fiscal year. On that date she had reached Newcastle Coal Landing, W. Va., 251 miles below Pittsburg.

The total record of obstructions removed by the *Woodruff* during the fiscal year was: Four hundred and sixty-one snags, whose weight aggregated 2,196 tons; 8 rocks, with total weight of 2.8 tons; 81 wrecks, viz, 48 coal barges, 24 coal boats, 3 steel-rail barges, 1 cinder barge, 1 fuel flat, 1 sand boat, and the hulls of 3 steamboats. The total number of miles run by the boat during the year was 6,983.

While the snag boat was in winter quarters (December 15, 1902, to May 6, 1903) miscellaneous repairs were made, as follows: General painting, \$168.35; boiler deck, \$250.22; main deck, \$65; large chimneys and forge, \$535; boilers and attachments, \$190.57; whistle, \$55; main engines, \$16.50; electric engine, \$7; pilot house, \$79.92; laundry and kitchen, \$24.25; minor repairs, \$28. Total, \$1,419.81.

Besides the work reported above, a number of abandoned wrecks, all within 41 miles of Pittsburg, were removed by the U. S. steam launch *Wenonah*, equipped with explosives and sent out from Davis Island dam, with a small crew under the direction of Inspector S. H. Fowler. The wrecks so removed were as follows: One coal boat above Lock No. 6; 1 coal barge at foot of Brunots Island; 2 coal boats and 1 coal barge at Beaver, Pa.; 1 coal boat at Phillis Island; 1 coal boat at the Trap; 1 coal barge at Sewickley, Pa., and 1 coal barge at Line Island.

In my last annual report (p. 1866, Report of Chief of Engineers for 1902) I expressed the opinion that if two light-draft steamboats were added to the plant pertaining to the general improvement of the Ohio River they would, among other purposes related to that work, be of very great utility as substitutes for the *Woodruff* during low-water periods. The experience of the last year gives the strongest confirmation of this opinion.

*List of steamboat wrecks, with names so far as known, removed from the Ohio River during fiscal year ending June 30, 1903, by the U. S. snag boat E. A. Woodruff.*

Name.	Location.	Miles below Pittsburg.
Cloverport.....	Tradewater bar.....	802
Unknown.....	Evansville, Ind.....	788
Do.....	Jeffersonville, Ind.....	596

Items 2 and 3 were reported as "Remains of two unknown steamboats near the landings at Evansville and Jeffersonville."

APPENDIX F F—REPORT OF COLONEL LYDECKER. 1649

*Summary of expenditures for operating snag boats on Ohio River for the fiscal year ending June 30, 1903.*

Office expenses and superintendence .....	\$5,125.00
Service .....	15,771.55
Subsistence .....	5,024.48
Fuel .....	2,943.79
Explosives, etc .....	98.50
General supplies and expenses .....	1,459.38
Care and repair of plant .....	1,837.38
Additions to plant .....	395.00
Total .....	32,655.08



## APPENDIX G G.

IMPROVEMENT OF HARBOR AT PITTSBURG, PENNSYLVANIA; OF ALLEGHENY RIVER, PENNSYLVANIA; OF MONONGAHELA RIVER, WEST VIRGINIA AND PENNSYLVANIA; CONSTRUCTION OF LOCKS AND MOVABLE DAMS NOS. 2-7, OHIO RIVER, AND OPERATING AND CARE OF DAVIS ISLAND DAM, OHIO RIVER.

REPORT OF CAPT. WM. L. SIBERT, CORPS OF ENGINEERS, OFFICER IN CHARGE, FOR THE FISCAL YEAR ENDING JUNE 30, 1902, WITH OTHER DOCUMENTS RELATING TO THE WORKS.

### IMPROVEMENTS.

- |   |  |
|---|--|
| 1. Monongahela River, West Virginia.  | 7. Construction of locks and dams at Herr Island, above head of Six-Mile Island, and at Springdale, Allegheny River. |
| 2. Monongahela River, Pennsylvania.   | 8. Operating and care of Herr Island Dam (No. 1), Allegheny River, Pennsylvania.                                     |
| 3. Operating and care of locks and dams, Monongahela River, West Virginia and Pennsylvania. | 9. Allegheny River, Pennsylvania.  |
| 4. Harbor at Pittsburg, Pennsylvania.   |  |
| 5. Operating and care of Davis Island Dam, Ohio River, near Pittsburg, Pennsylvania.        |  |
| 6. Construction of Locks and Dams Nos. 2-7, Ohio River, Pennsylvania.                       |  |

### SURVEY.

10. Pool No. 1, Ohio River (Davis Island Pool), Pittsburg Harbor, Pennsylvania.

### HARBOR LINES.

- |  |   |
|--|---|
| 11. Monongahela River, from Wilson to Elizabeth, Pennsylvania. | 13. Pittsburg Harbor, Pennsylvania, from Smithfield Street Bridge, Monongahela River, to Tenth street, Allegheny River. |
| 12. Monongahela River at Hazelwood, Pennsylvania.              | 14. Allegheny River at Pittsburg, Pennsylvania.   |

UNITED STATES ENGINEER OFFICE,  
*Pittsburg, Pa., July 15, 1903.*

GENERAL: I have the honor to forward herewith annual reports of works under my charge for the year ending June 30, 1903.

Very respectfully, your obedient servant,

WM. L. SIBERT,  
*Captain, Corps of Engineers.*

Brig. Gen. G. L. GILLESPIE,  
*Chief of Engineers, U. S. A.*

## G G 1.

## IMPROVEMENT OF MONONGAHELA RIVER, WEST VIRGINIA.

A detailed description of the work done during the fiscal year ending June 30, 1903, will be found in the attached report of Asst. Eng. J. L. Callard.

*Money statement.*

July 1, 1902, balance unexpended .....	\$302,890.17
June 30, 1903, amount expended during fiscal year .....	453,829.67
July 1, 1903, balance unexpended .....	349,060.50
July 1, 1903, outstanding liabilities .....	4,037.61
July 1, 1903, balance available .....	345,022.89
July 1, 1903, amount covered by uncompleted contracts .....	348,705.43
{ Amount (estimated) required for completion of existing project .....	100,000.00
{ Amount that can be profitably expended in fiscal year ending June 30, 1905, for works of improvement, in addition to the balance unexpended July 1, 1903 .....	100,000.00
{ Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

## APPROPRIATIONS.

June 10, 1873, improving Monongahela River between Morgantown and New Geneva .....	\$25,000
March 3, 1873, improving Upper Monongahela River near Morgantown, W. Va. ....	66,000
June 23, 1874, improving Upper Monongahela River near Morgantown, W. Va. ....	25,000
March 3, 1875, improving Upper Monongahela River near Morgantown, W. Va. ....	22,000
June 18, 1878, improving Monongahela River, West Virginia and Pennsylvania .....	25,000
March 3, 1879, improving Monongahela River, West Virginia and Pennsylvania .....	24,000
June 14, 1880, improving Monongahela River, West Virginia .....	25,000
March 3, 1881, improving Monongahela River, Pennsylvania and West Virginia .....	25,000
August 2, 1882, improving Monongahela River, West Virginia .....	25,000
July 5, 1884, improving Monongahela River, West Virginia .....	45,000
August 5, 1886, improving Monongahela River, Pennsylvania and West Virginia .....	90,900
August 11, 1888, improving Monongahela River, West Virginia .....	35,000
September 25, 1889 (allotment) .....	4,000
July 13, 1892, improving Monongahela River, West Virginia .....	25,000
August 18, 1894, improving Monongahela River, West Virginia and Pennsylvania .....	20,000
June 3, 1896, improving Upper Monongahela River, West Virginia .....	80,000
June 4, 1897, improving Upper Monongahela River, West Virginia .....	350,000
July 1, 1898, improving Upper Monongahela River, West Virginia .....	400,000
June 28, 1902, improving Monongahela River, West Virginia .....	350,000
Total .....	1,611,900



## ABSTRACT OF CONTRACTS IN FORCE.

*Completing Locks and Dams 10 and 11, Monongahela River.*

Contractors: Baker & Judson, Gloversville, N. Y.

Rates: Original contract. Grubbing and clearing, \$200 lump bid; earth excavation, 50 cents per cubic yard; hard-pan excavation, \$1.25 per cubic yard; rock excavation, \$3 per cubic yard; embankment, 30 cents per cubic yard; concrete, \$7.25 per cubic yard; stone ballast in cribs, \$2 per cubic yard; stone paving, \$2.50 per square yard; timber for gates, spars, quoins, and sills, \$80 per M feet B. M.; timber for cribs, Class A, \$30 per M feet B. M.; timber for cribs, Class B, \$60 per M feet B. M.; driftbolts, 5 cents per pound; screw bolts, 5 cents per pound.

Rate: Supplemental contract. Broken stone in drain at Lock No. 11, \$2 per cubic yard.

Date of approval: Original, June 3, 1901; supplemental, July 7, 1902.

Date of beginning: June 26, 1901.

Date of expiration: June 26, 1903 (extended for a reasonable period).

*Building Locks and Dams 12 and 13, Monongahela River.*

Contractor: The T. A. Gillespie Company, Pittsburg, Pa.

Rates: Original contract. Grubbing and clearing, \$500 lump bid; earth excavation, 40 cents per cubic yard; hard-pan excavation, \$1 per cubic yard; rock excavation, \$1.50 per cubic yard; embankment, 30 cents per cubic yard; concrete, \$8.10 per cubic yard; stone ballast in cribs, \$2 per cubic yard; stone paving, \$2.25 per square yard; timber for gates, spars, quoins, and sills, \$88 per M feet B. M.; timber for cribs, Class A, \$50 per M feet B. M.; timber for cribs, Class B, \$50 per M feet B. M.; driftbolts, 4 cents per pound; screw bolts, 4 cents per pound.

Rate: Supplemental contract. Broken stone in drains at Locks Nos. 12 and 13, \$2 per cubic yard.

Date of approval: Original, May 3, 1901; supplemental, July 7, 1902.

Date of beginning: May 24, 1901.

Date of expiration: May 24, 1903 (extended for a reasonable period).

*Building Locks and Dams 14 and 15, Monongahela River.*

Contractor: The T. A. Gillespie Company, Pittsburg, Pa.

Rates: Original contract. Grubbing and clearing, \$500 lump bid; earth excavation, 60 cents per cubic yard; hard-pan excavation, 75 cents per cubic yard; rock excavation, \$2 per cubic yard; embankment, 50 cents per cubic yard; concrete, \$8.10 per cubic yard; stone ballast in cribs, \$2 per cubic yard; stone paving, \$2 per square yard; timber for gates, spars, quoins, and sills, \$90 per M feet B. M.; timber for cribs, Class A, \$40 per M feet B. M.; timber for cribs, Class B, \$50 per M feet B. M.; driftbolts, 4 cents per pound; screw bolts, 5 cents per pound.

Rate: Supplemental contract. Broken stone in drains at Locks Nos. 14 and 15, \$2 per cubic yard.

Date of approval: Original, July 18, 1901; supplemental, July 7, 1902.

Date of beginning: August 5, 1901.

Date of expiration: August 5, 1903.

*Building a dwelling at each of Locks 11, 12, and 13, Monongahela River.*

Contractor: Thomas J. Williams, Pittsburg, Pa.

Rate: \$2,890 each.

Date of approval:<sup>a</sup>

Date of beginning: December 15, 1902.

Date of expiration: May 15, 1903 (extended for a reasonable period).

*Building a dwelling at Lock 15, Monongahela River.*

Contractor: Thomas J. Williams, Pittsburg, Pa.

Rate: \$3,000.

Date of approval:<sup>a</sup>

Date of beginning: January 2, 1903.

Date of expiration: June 2, 1903 (extended for a reasonable period).

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<sup>a</sup> Emergency contract.

1654 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

*Building an office building at Lock No. 14, Monongahela River.*

Contractors: Kammerer & Kern, Morgantown, W. Va.

Rate: \$885.

Date of approval: <sup>a</sup>

Date of beginning: January 20, 1903.

Date of expiration: April 30, 1903.

*Building an office building at Lock No. 10, Monongahela River.*

Contractor: Joseph J. Wharton, Morgantown, W. Va.

Rate: \$800.

Date of approval: <sup>a</sup>

Date of beginning: January 24, 1903.

Date of expiration: April 30, 1903.

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COMMERCIAL STATISTICS.

*Traffic through United States Locks Nos. 8 and 9 for the fiscal year 1903.*

Lock No. 8:		
Freight .....	tons	113,326
Passengers .....	number	23,240
Lock No. 9:		
Freight .....	tons	92,831
Passengers .....	number	18,682

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REPORT OF MR. J. L. CALLARD, ASSISTANT ENGINEER.

*Lock and Dam No. 10.*—Under their contract Baker & Judson are to complete the construction of the upper and lower guide cribs and the upper and the lower guard cribs and a section of dam about 133 feet in length. The cribs were completed in November, 1901. Work on the construction of the section of dam has not been commenced.

Under written agreement, Baker & Judson are to build an upper guide wall 150 feet in length. The wall is to be of concrete upon a pile foundation. The pile foundation is completed.

The following was done by purchase of material and hire of labor during the fiscal year: Riprap protection was extended downstream about 1,200 feet on the left bank of the river below the lock; paving the slope connecting the lock and the dwelling terrepleins was completed.

A channel approach to the lower entrance to the lock was dredged, removing 4,296 cubic yards of material. The dredging was done by the hour by the Monongahela and Western Dredging Company.

The lock gates were built and hung to place, and gate-maneuvering gear was placed by the repair steamer *Slackwater*.

The two dwellings were completed in February, and the office building was completed in May. Joseph J. Wharton, contractor.

*Lock and Dam No. 11.*—Baker & Judson, contractors.

The actual work of construction was commenced in August, 1901. The present condition of the work is as follows: All walls of the lock, lower and upper guide walls, and the upper guard crib are completed. The core wall and two sections of dam, aggregating 317 feet in length, and the foundation for a section of dam 30 feet in length are completed. The retaining wall, 200 feet in length, for retaining the right bank of the river immediately below the abutment end of the dam is completed, and the river bank above the wall has been partly graded and paved with stone. The stone drain and filling back of the left lock and the lower guide walls are completed, and the grading of the lock grounds is about one-third completed. The upper gate and the right leaf of the lower gate are hung to place, and the left leaf of the lower gate is practically ready to be hung to place. About 140 square yards of paving are laid on lock terreplein.

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<sup>a</sup> Emergency contract.

All the above-mentioned work was done during the fiscal year except excavating for and laying the foundation walls for the lock and constructing 90 linear feet of the right wall and 80 linear feet of the left wall of the lock.

The following quantities represent the material furnished and the work accomplished:

	During fiscal year.	Prior to July 1, 1902.	Total to date.
Earth excavated.....cubic yards.....	5,989	3,200	9,189
Hardpan excavated.....do.....	88	226	314
Rock excavated.....do.....	655	2,604	3,349
Embankment placed.....do.....	2,554		2,554
Concrete laid.....do.....	14,061	4,479	18,540
Stone ballast placed.....do.....	1,002		1,002
Stone drain laid.....do.....	1,085		1,085
Stone paving laid.....square yards.....	450		450
Timber used for crib.....feet B. M.....	73,578		73,578
Timber used for gates, quoins, etc.....do.....	40,832		40,832
Driftbolts.....pounds.....	6,255		6,255
Iron for gates.....do.....	46,194		46,194
Iron for gate-maneuvering gear.....do.....	4,783		4,783

During the fiscal year the work was delayed but very little by freshets until November 26, when, owing to continued high water, operations were suspended for the season and were not resumed until about May 1. Construction of lock gates was continued during the winter, and several odd pieces of work were done during the finer weather of early spring. Very little construction work was done in June, owing to several small freshets.

\* \* \* \* \*  
The dwelling is about 65 per cent completed. Thomas J. Williams, contractor. *Lock and Dam No. 12.*—The T. A. Gillespie Company, contractors.

The actual work of construction was commenced in June, 1901. The present condition of the work is as follows: All walls of the lock, lower guide wall and upper guard crib, stone drain and filling back of the left lock, and the lower guide walls are completed. Grading the lock grounds is about three-fourths completed; the required paving of the lock terreplein and of the slope connecting the lock and dwelling terrepleins is laid, except about 75 linear feet of the slope, which can not be laid until the concrete mixer is moved. The excavation for the upper guide wall is about three-fourths completed, and a section of the wall 25 feet in length is laid. The protection of the right bank of the river immediately below the dam is about completed. Three sections of dam, aggregating 321 linear feet, and the foundations for the three remaining sections of dam, aggregating 104 linear feet, are built. The upper lock gate is hung to place, and the timber for the lower gate, sills, and hollow quoins are framed.

Of the above-mentioned work the following was done during the fiscal year: The construction of 52 linear feet of the right lock wall and all the work done on the construction of the dam; the grading and paving of the lock grounds and the protection of the right bank of the river below the dam; the construction of the lower guide wall and about one-third of the upper guard crib; the framing of the greater part of the timber for gates, miter sills, and hollow quoins, and the assembling and hanging to place of the upper gate.

The following quantities represent the material furnished and the work accomplished:

	During fiscal year.	Prior to July 1, 1902.	Total to date.
Earth excavated.....cubic yards.....	3,720	1,788	5,508
Hardpan excavated.....do.....	1,093	2,460	3,553
Rock excavated.....do.....	782	3,903	4,685
Embankment placed.....do.....	1,216	2,890	4,106
Concrete laid.....do.....	6,311	10,112	16,423
Stone ballast placed.....do.....	361	437	798
Stone drain laid.....do.....	749		749
Stone paving laid.....square yards.....	1,206	31	1,237
Timber used for crib.....feet B. M.....	18,946	28,570	47,516
Timber used for gates, quoins, etc.....do.....	21,653		21,653
Driftbolts.....pounds.....	3,836	1,322	5,158
Iron for gates.....do.....	46,194		46,194
Iron for gate maneuvering gear.....do.....	4,811		4,811

# 1656 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

Owing to the continued high water, operations were suspended for the season on November 26, 1902, except that framing timber for the gates was continued. Such work as grading lock grounds and paving certain required parts of the grounds was resumed in April. Work upon the construction of the dam has not been resumed this season, the water having been too high the greater part of the time to admit of building a cofferdam.

The only accident of importance during the fiscal year was the wrecking of the right leaf of the upper gate. In November a needle dam was built across the upper end of the lock chamber, provision having been made for the placing of such a dam across either end of the chamber of each lock. On December 11 the right leaf of the upper gate was hung to place and left open, but not securely fastened. On the night of the 13th, the water having risen to the level of the top of the lock walls, the needle dam failed by the breaking of the timber beam which supported the upper end of the needles. The rush of water through the lock chamber carried the leaf against the miter sill with such force as to completely wreck it.

\* \* \* \* \*

The foundation for the dwelling is built, but the construction of the dwelling is not commenced. Thomas J. Williams, contractor.

*Lock and Dam No. 13.*—The T. A. Gillespie Company, contractors.

The actual work of construction was commenced in June, 1901. The present condition of the work is as follows: All walls of the lock, lower guide wall, upper guard crib, and dam are completed. The stone drain back of the left lock and the lower guide walls is completed. The grading of the lock grounds is about three-fourths completed. The upper lock gate is assembled ready to be hung to place. The heel and the toe posts and 7 arms for the lower gate are framed, and the timber hollow quoins for the intermediate and the lower gates are about one-half framed. The right bank of the river was paved for a distance of 125 feet immediately below the dam, but the greater part of it, about 200 square yards, was washed away by the winter floods. The bank is also protected for a distance of 340 feet below the paved part and for a distance of 35 feet above the dam with riprap.

Of the above-mentioned work the following was done during the fiscal year: About one-fourth of the foundations for the lock walls, 112 linear feet of the right lock wall, 169 linear feet of the left lock wall, and all the dam, except a section 20 feet in length; about one-third of all excavation and one-half of the grading of lock grounds; all the stone paving and riprap protection; the lower guide, the head, the tail, and the upper miter walls, and about one-third of the upper guard crib; all work on gates, quoins, and sills.

The following quantities represent the material furnished and the work accomplished:

	During fiscal year.	Prior to July 1, 1902.	Total to date.
Earth excavated .....	1,119	5,105	6,224
Hardpan excavated .....	do.	608	608
Rock excavated .....	765	2,248	3,013
Embankment placed .....	3,176	2,495	5,671
Concrete laid .....	9,205	6,090	15,295
Stone ballast placed .....	525	495	1,020
Stone drain laid .....	878	do.	878
Stone paving laid .....	507	do.	507
Timber used for crib .....	27,868	26,700	54,568
Driftbolts .....	3,208	1,545	4,753
Iron for gates .....	46,205	do.	46,205
Iron for gate maneuvering gear .....	4,800	do.	4,800

The construction of the lock walls and the dam was completed on October 31. Operations for the season were suspended about the middle of November, except framing timber for lock gates, which was continued during the winter. The plant was dismantled, taken to and assembled for use at Lock No. 14. Work was resumed in April, but very little has been done this season.

On December 13 a needle dam across the upper end of the lock chamber was carried away during a flood by the failure of the timber beam supporting the upper end of the needles. No damage was done.

It was found necessary this spring to remove a ledge of rock that projected beyond the graded and paved slope of the right bank of the river immediately below the dam. The top of the ledge was of about the same elevation as that of the crest of the dam, having an average width of about 15 feet and extending

downstream 115 feet. The top of the ledge dipped toward the bank, thus causing a wash of the bank, because of which about 200 square yards of paving were carried away by the winter floods. About 875 cubic yards of rock was removed, of which more than one-half was used to replace material washed from the bank. It was also found necessary to protect the bank with riprap for a distance of 265 feet farther downstream than had already been done to prevent the undermining of the railroad bank by the wash of the current at times of freshets. The rip-rapping and the removal of the ledge of rock was done by purchase of material and hire of labor.

\* \* \* \* \*

The foundation for the dwelling is built, but the construction of the dwelling is not commenced. Thomas J. Williams, contractor.

*Lock and Dam No. 14.*—The T. A. Gillespie Company, contractors.

Actual construction was commenced in September, 1902. The present condition of the work, all of which was done during the fiscal year, is as follows: The excavation for the foundation of lock walls, and the grading of lock grounds are about three-fourths completed. A section of the left lock wall, 121 feet in length; a section of the right lock wall, 83 feet in length; the upper guide wall, 100 feet in length; a section of dam, 60 feet in length, and the core wall at abutment end of dam are built. The heel and the toe posts, two arms, and the sills for the upper gate are framed.

The following quantities represent the material furnished and the work accomplished:

	During fiscal year.	Prior to July 1, 1902.	Total to date.
Earth excavated.....cubic yards..	4,395	-----	4,395
Hardpan excavated.....do.....	465	-----	465
Rock excavated.....do.....	1,170	-----	1,170
Embankment placed.....do.....	1,040	-----	1,040
Concrete laid.....do.....	4,869	-----	4,869
Stone drain laid.....do.....	80	-----	80

Operations on actual construction were suspended for the season on November 20 by reason of high water, but a force of men were employed all winter assembling plant. Operations were resumed the early part of March.

\* \* \* \* \*

The office building was completed in March. The foundation for the dwelling is built, but the construction of the dwelling is not commenced. Kammerer & Kern, contractors.

*Lock and Dam No. 15.*—The T. A. Gillespie Company, contractors.

Actual construction was commenced in September, 1901. The present condition of work is as follows: All walls of the lock, the lower guide wall, a section of dam 40 feet in length, the upper guard crib and the stone drain back of the right lock wall are completed. The excavation for the channel to the lower entrance to the lock is about three-fourths completed. The grading of the lock grounds is about two-thirds completed. The heel and toe posts and 14 arms for the upper gate, 6 arms for the lower gate, and all the hollow quoins are framed.

All the above-mentioned work was done during the fiscal year, except the excavation for the channel entrance, lock chamber, and the foundation for lock walls and laying 200 cubic yards of concrete.

The following quantities represent the material furnished and the work accomplished:

	During fiscal year.	Prior to July 1, 1902.	Total to date.
Earth excavated.....cubic yards..	790	1,195	1,985
Rock excavated.....do.....	124	6,230	6,354
Embankment placed.....do.....	2,699	2,925	5,624
Concrete laid.....do.....	9,151	200	9,351
Stone ballast placed.....do.....	745	-----	745
Stone drain laid.....do.....	918	-----	918
Timber used for crib.....B. M.....	51,838	-----	51,838
Screw bolts.....pounds.....	153	-----	153
Drift bolts.....do.....	3,697	-----	3,697
Iron for gates.....do.....	46,182	-----	46,182
Iron for gate maneuvering gear.....do.....	4,808	-----	4,808

1658 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

Owing to continued high water, operations for the season were suspended on December 15. Operations were resumed on April 10, but very little work has been accomplished this season.

\* \* \* \* \*  
The dwelling is about 70 per cent completed. Thomas J. Williams, contractor.

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G G 2.

IMPROVEMENT OF MONONGAHELA RIVER, PENNSYLVANIA.

*Locks 3, 6, and floating plant.*—The two dump scows under construction during the last fiscal year have been completed and delivered by the contractor. The dredge boat under construction at that time is completed but not yet delivered.

Contract was let September 23, 1902, to T. M. Rees, Pittsburg, Pa., for building a snagging steamer. This boat has been launched and is nearing completion.

*Rebuilding Lock No. 2.*—Preliminary surveys for a new lock and dam site below old Lock No. 2 were completed in August. An examination by steel rods and one drilling showed two favorable places, one at the abutment end of the old dam and one at the Carnegie Steel Works, about 3,200 feet farther down the river.

Objections to the second-named site were raised by the Westinghouse Electric and Manufacturing Company, whose plant is about 1½ miles above the mouth of Turtle Creek, which enters the river at a point about 1,600 feet above this site. It was argued that the elevation of the water surface to the level of existing pool No. 2 would increase the height of floods from Turtle Creek at the company's works. An investigation was made and the result submitted to the engineers of the company. It was finally decided that the excessive heights of certain Turtle Creek floods (15 feet above the Monongahela flood plane) were due to the number of bridges and contracted places in said creek, and that the proposed elevation of the pool level would not increase the height of the flood plane at their works. Upon the settlement of the questions raised by the Westinghouse Company, negotiations were resumed with the Carnegie Steel Company for a site at their landing, 3,200 feet below the old dam.

On February 19, 1903, a Board of Engineer Officers, constituted by Special Order No. 23, Headquarters, Corps of Engineers, series of 1902, met in Pittsburg, Pa., for the purpose of selecting a suitable site for a lock and dam and submitted its report the same day, recommending the adoption of the site at the Carnegie Steel Company's landing, provided the cost of land necessary did not exceed \$30,000.

Late in February the Carnegie Steel Company agreed to deed the site for the above stipulated amount. A plan and description of the property desired by the United States were furnished the company, but owing to the discovery of certain existing mortgages the execution of the deed of the property has been delayed. It is expected that during July the deed will be executed satisfactorily. The United States district attorney has been authorized to assist this office in obtaining a satisfactory title before the same is forwarded to the Attorney-General for final action.

*The plans and specifications for the new lock and dam have been completed and approved.*

*Money statement.*

July 1, 1902, balance unexpended.....	\$289,753.13
Amount appropriated by sundry civil act approved March 3, 1903 ...	455,961.00
	<hr/>
August 18, 1902, amount carried to surplus fund.....	745,714.13
June 30, 1903, amount expended during fiscal year .....	2,842.94
	<hr/>
July 1, 1903, balance unexpended.....	703,210.12
July 1, 1903, outstanding liabilities.....	34,804.69
	<hr/>
July 1, 1903, balance available.....	668,405.43
July 1, 1903, amount covered by uncompleted contracts.....	48,230.00
	<hr/>

## APPROPRIATIONS.

August 11, 1888, costs of condemnation, Lock and Dam No. 7, Monongahela River, Pennsylvania .....	<sup>a</sup> \$5,000.00
September 19, 1890, costs of condemnation, Lock and Dam No. 6, Monongahela River, Pennsylvania.....	<sup>b</sup> 5,000.00
August 11, 1888, purchase of upper lock and dam (No. 7), Monongahela River.....	<sup>c</sup> 161,733.13
September 19, 1890, purchase of upper lock and dam (No. 6), Monongahela River.....	<sup>b</sup> 162,000.00
June 3, 1896, cost of condemnation property of Monongahela Navigation Company .....	<sup>d</sup> 5,000.00
June 3, 1896, award for property of Monongahela Navigation Company .....	3,761,615.46
March 3, 1899, improving Locks 3 and 6 and for floating plant.....	50,000.00
June 6, 1900, completing improvement at Locks 3 and 6 and for floating plant.....	135,556.00
June 13, 1902, rebuilding Lock and Dam 2.....	200,000.00
March 3, 1903, rebuilding Lock and Dam 2.....	455,961.00
	<hr/>
Total.....	4,941,865.59
Amount carried to surplus fund.....	331,274.71
	<hr/>
	4,610,590.88

## ABSTRACT OF CONTRACTS IN FORCE.

*Building a dredge hull and furnishing and installing machinery therein.*

Contractor: M. A. Sweeney Shipyard and Foundry Company, Jeffersonville, Ind.  
 Rate: \$19,740.  
 Date of approval: May 22, 1902.  
 Date of beginning: June 3, 1902.  
 Date of expiration: December 26, 1902 (extended for a reasonable period).

*Building a steel single hull repair steamer with snagging appliances.*

Contractor: Thomas M. Rees, Pittsburg, Pa.  
 Rate: \$51,800.  
 Date of approval: September 29, 1902.  
 Date of beginning: October 10, 1902.  
 Date of expiration: July 1, 1903.

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<sup>a</sup> Partly applied; \$98.64 to surplus fund.  
<sup>b</sup> To surplus fund.  
<sup>c</sup> Partly applied; \$161,333.13 to surplus fund.  
<sup>d</sup> Partly applied; \$2,842.94 to surplus fund.

## G G 3.

OPERATING AND CARE OF LOCKS AND DAMS, MONONGAHELA RIVER,  
WEST VIRGINIA AND PENNSYLVANIA.

Only slight damage was done to these locks and dams, resulting from freshets and ice gorges. One of the March freshets was attended with an unusually swift current, the Allegheny River being low at the time, which resulted in a disaster at Dam No. 1 where a fleet of 60 loaded coal barges which had broken loose from its moorings was swept over the dam, involving the total loss of 16 of them and damages to a number of others.

The principal repairs and improvements were as follows:

*Lock and Dam No. 1, Pittsburg.*—The shore guide crib above the lock, 300 feet long, was reconstructed. Materials used were as follows:

279,722 feet B. M. oak.  
2,165 cubic yards stone.  
676 cubic yards gravel ballast.  
12,853 pounds bolts and spikes.

The crib rested on rock at a depth of 10 feet below pool level. A dredge was employed to remove it, but before the first section could be placed during a storm in September, a defective sewer on Second avenue failing to discharge properly, resulted in a slide from the avenue involving the water and gas mains and the outer track of the street-car line for a length of about 90 feet, which required raising from time to time to the amount of about 4 feet.

Work on the reconstruction of the engine house on the land wall and on the rearrangement of boilers, electric-light plant, etc., is nearly completed. The floor was raised 7 feet. One new engine and boiler and a new dynamo for the arc lighting plant were purchased and installed.

The undershot wheel on the dam was furnished with new arms and buckets and numerous minor repairs were made to lock walls, operating machinery, etc. In repairs to gates 1,058 feet B. M. of oak plank were used.

*Lock and Dam No. 2, Port Perry.*—In repairs to the lower guide crib 9,000 feet B. M. oak and 400 feet B. M. hemlock were used. The engine operating the middle wall gates received two new valves. A new closing spar was placed on one of the lower gates. The water-wheel on dam was overhauled. A new boiler was placed in engine house on the middle wall and a ventilator was placed in the roof. The land wall turbine was repaired. Five hundred and eighteen feet B. M. of oak plank were used in repairs to lock gates. Two lock service flats 45 feet long were built at this lock.

*Lock and Dam No. 3, above Elizabeth.*—A serious leak in the river wall of the outside lock was repaired, 13 barrels of cement, 50 bushels of sand, and 4,000 feet of lumber being used in the work. The wickets of one of the gates were repaired, as were the filling valves in floor of the large lock. One thousand six hundred and five feet B. M. of oak plank were used in gate repairs. The turbine on middle wall was repaired and masonry joints of small lock thoroughly pointed.

*Lock and Dam No. 4, below Charleroi.*—A 200-foot section of guide crib was reconstructed, 148,787 feet B. M. of oak and hemlock, 10,664 pounds of driftbolts, 625 cubic yards of gravel, and 2,577 cubic yards of stone ballast being used.



The roadway along the bank was graded and a concrete wall 180 feet long was constructed along its inner side and around the lock-master's dwelling. The old brick dwelling was razed and a new six-room dwelling constructed on a different site by contract at a cost of \$2,950. The foundations and an extension of the porch were built by the United States.

One thousand four hundred and forty feet B. M. oak plank were used in repairs to gates; 5,755 feet B. M. oak and 1,040 feet B. M. pine in repairs to penstock of turbine, and 1,785 feet B. M. of oak for a new capstan stand.

One of the gates was thrown out of use for three days in March owing to its being struck by a river steamer.

A local storm in June caused an influx of water from the hillside which damaged the grading.

*Lock and Dam No. 5, above Brownsville.*—The wickets of both gates were repaired. Three hundred and fifty feet B. M. of oak plank were used in gate repairs.

*Lock and Dam No. 6, Rice's Landing.*—A new suspension fork was placed on left leaf of lower gate and the wickets of right leaf were repaired. Fences about the property were rebuilt and painted. A new spar was placed in position at one of the gates. Repairs to one of the lower gate leaves in May necessitated a twenty-four-hour suspension of navigation.

*Lock and Dam No. 7, below Greensboro.*—The foundation of the old frame building was rebuilt, it being considered unsafe. The chimneys were rebuilt, 70 cubic yards of masonry were laid, a new cement floor was put in basement, and some plastering was done.

A pipe hand rail was placed on wall between the two dwellings and 600 feet of 1-inch galvanized iron pipe were laid, connecting the premises with a spring of water.

One hundred and forty cubic yards of earth which had slipped from the hillside were removed from the terrace. One hundred feet of 6-inch sewer pipe were laid to drain the terreplein. In May the work of rebuilding the 240-foot guard crib above the lock was started, and is not yet quite completed.

*Lock and Dam No. 8, mouth of Dunkard Creek.*—A sluiceway under right wall lower turbine was cut and planked over and decayed pillow blocks of pinion shaft for operating-filling valves were renewed. The abutment masonry was grouted and pointed. Several rooms of the lock master's dwelling were papered and the woodwork was painted. About 45 square yards of chamber face masonry showing decay were dressed out to the depth of 10 to 12 inches and concreted. Three hundred and fifty cubic yards of riprap stone were used for protection of river bank on both shores below the dam. A new oil-box thrust bearing was placed in turbine shaft and turbine taken out and repaired.

Work was commenced under contract for addition to lock master's dwelling, and during June material was being assembled for the construction of a new guide crib above the lock.

*Lock and Dam No. 9, Hoard, W. Va.*—Work was commenced in August in strengthening the river wall of the lock with a reinforcement of concrete on its river side. As built, this wall on the 147-foot section between gates had a base of  $11\frac{1}{2}$  feet,  $27\frac{1}{2}$  feet height, and 7 feet width at top, the entire wall resting on rock. With the gradual disintegration of the mortar, which in crumbling washed out of the masonry, it became unstable, with a permanent outset of about 12 inches near the middle and top, and a further temporary deflection

back and forth when the lock was filled or emptied at high navigable stages of 2 to 3 inches. When the lock walls are about to be submerged with a rising river, the "head" at No. 9 is frequently as much as 10 feet, greatly exceeding the lift at similar stages at the other locks along the river. It was necessary to build a cofferdam outside of and paralleling the wall in order to clean out the ditch cut in the rock close to the wall. The concrete addition at its base ranged from  $4\frac{1}{2}$  to 6 feet in width and was carried up vertically a few feet; thence on a batter terminating beneath the coping course with a thickness of 18 inches. It was pinned to the old wall at frequent intervals with 1-inch bent irons. In addition to this backing 44 holes were drilled vertically through the wall to bed rock, into which were poured in the form of grout 80 barrels of cement and 166 barrels of fine sand. The concrete backing amounted to 507 cubic yards. This is the second lock wall on the Monongahela River treated in this manner, and thus far with success. The work at No. 9 was completed in November.

New capstans were placed and rigged for operating right leaf lower gate and new opening and closing capstans for operating the upper gate were also placed. In May the filling valves were thoroughly overhauled and repaired, the lock being closed for five days to effect this. Sixty cubic yards of débris found in the valve pits and forebay were removed. One hundred and thirty cubic yards of riprap stone were placed on the right bank of the river below the lock. The lower guide crib above the water line was repaired and new plank covering was placed on it.

In June work was commenced under contract for an addition to the lock master's dwelling and the construction of a frame office building.

*Boat yard and shop, Lock No. 4.*—Work on new gates and repairs of old gates kept a number of carpenters busymost of the year. The new repair steamer *Slackwater*, with quarters for about 24 men, reached the yard in the fall, and during the winter the engines which had been purchased were transferred to her, and the *Slackwater* was sent to Pittsburg for her new boilers. Owing to a strike of the boiler makers, the boilers were not quite completed at the end of the year. It is the intention to move the steel derrick, dynamo, etc., from the old *Slackwater* to the new boat and dismantle the old steamer which has been in continuous service since 1883.

A new derrick boat with double-cylinder 7 by 10 inch engines, and a new quarter boat 85 by 22 feet, with accommodations for 24 men, were built complete at the yard, and work was commenced on a maneuvering boat for Dam No. 6, Ohio River.

New rudders and new pillow blocks for the wheel were placed on the inspection stern-wheel steamer *Loma*. The naphtha launch *Luzon* was overhauled and placed in serviceable condition.

A raft of pine and one of oak logs were purchased for miscellaneous work, the sawing to be done at the new mill.

An addition to the machine shop for the 1,500 pound steam hammer and a building for a planing machine and other wood-working machines were commenced. A frame office building 17 by 32 feet, with two rooms, was also constructed near the carpenter shop.

*Dredging during fiscal year 1903.*

Date.	Pool.	Location.	General description of work.	Cubic yards.
1902.				
November .....	2	Lock No. 3, lower approach .....	Coal and sand .....	3,179
1903.				
March .....	2	.....do .....	.....do .....	3,515
April .....	2	.....do .....	.....do .....	6,830
May .....	1	Lock No. 1, upper approach .....	Sand, gravel, and ashes .....	3,900
Do .....	2	Lock No. 2 above, along shore .....	Sand, gravel, and stones .....	19,000
June .....	1	Lock No. 1, upper approach .....	.....do .....	4,300
Do .....	Davis Island.	Lock No. 1, below .....	.....do .....	100
		Total .....		40,824

Date.	Pool.	Location.	Removal of obstructions.	Time.
1902.				<i>Hrs. min.</i>
August .....	Davis Island.	Lock No. 1, lower end of guide wall below lock.	Accumulated materials and 1 large rock.	16 0
September .....	1	Lock No. 1, guide crib above .....	Old guide crib and material involved in landslide.	122 15
October .....	1	.....do .....	Material outside new guide crib and throwing it behind for back filling.	16 30
Do .....	1	.....do .....	Filling gravel into flats for back filling for new guide crib.	15 0
Do .....	Davis Island.	Lock No. 1, end of lower guide crib.	Sand and gravel .....	35 30
November .....	4	Lock No. 4, guide crib above .....	Old guide crib and excavating foundation for new crib.	76 0
		Total .....		281 15

Date.	Pool.	Work by scraper and towboat.	Time.
1902.			<i>Hrs. min.</i>
September .....	1	Scraping foundation for new guide crib above No. 1 .....	22 30

*Snagging.*—There were removed from the channel in the various pools the following snags, trees, and stumps: Pool 3, 3; pool 8, 210.

*Removal of obstructive wrecks.*—One barge and one boat, both loaded with coal, sunk in channel near Glenwood Bridge, were blown up with dynamite; pool 3 at Monongahela city, wreck of the steamer *Hawk*, removed by using 1,000 pounds of dynamite; pool 2, wreck of coal boat opposite Glassport, removed by using 1,100 pounds of dynamite; and pool 1, wreck of coal boat near P. and L. E. R. bridge at Homestead, removed by using 450 pounds of dynamite.

*Monthly lockages of vessels at different dams.*

	Dam.								
	1.	2.	3.	4.	5.	6.	7.	8.	9.
1902.									
July .....	2,387	2,041	1,633	1,531	506	297	230	223	184
August .....	2,318	2,274	1,923	1,723	730	370	297	306	221
September .....	1,692	1,647	1,625	1,423	528	324	242	241	172
October .....	1,819	1,873	1,937	1,747	692	375	206	181	155
November .....	1,322	1,499	1,654	1,632	624	254	122	126	65
December .....	2,267	1,812	1,587	1,368	459	189	101	91	70
1903.									
January .....	1,531	1,507	1,507	1,295	377	123	64	42	24
February .....	1,435	1,556	1,522	1,308	882	153	51	57	49
March .....	2,008	1,894	1,761	1,555	540	303	101	95	86
April .....	2,041	2,083	1,705	1,527	536	220	135	155	116
May .....	1,689	1,974	1,876	1,712	816	364	151	171	112
June .....	1,841	1,804	1,709	1,547	630	245	180	148	125
Total .....	22,350	21,984	20,439	18,366	6,919	3,016	1,839	1,836	1,379

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The locks were temporarily closed to navigation for times and reasons as follows:

Locks.	Repairs.	Floods.	Ice.	Total time.	Number of times.
	<i>d. h. m.</i>	<i>d. h. m.</i>	<i>d. h. m.</i>	<i>d. h. m.</i>	
No. 1:					
Large .....	0 0 0	9 15 30	0 0 0	9 15 30	8
Small .....	0 0 0	9 15 30	0 0 0	9 15 30	8
No. 2:					
Large .....	1 18 0	10 5 25	0 0 0	11 23 25	8
Small .....	0 0 0	10 5 25	0 0 0	10 5 25	7
No. 3:					
Large .....	0 22 40	7 12 30	8 0 0	16 11 10	9
Small .....	1 12 30	7 12 30	8 0 0	17 1 0	12
No. 4:					
Large .....	0 0 0	9 15 5	0 0 0	9 15 5	6
Small .....	0 0 0	13 20 15	0 0 0	13 20 15	9
No. 5:					
Large .....	0 13 20	9 12 0	0 0 0	10 0 20	9
No. 6:					
Large .....	1 21 0	6 8 0	0 0 0	8 0 0	7
No. 7:					
Large .....	0 0 0	9 13 45	8 0 0	17 13 45	10
No. 8:					
Large .....	0 0 0	5 4 25	0 0 0	5 4 25	6
No. 9:					
Large .....	21 2 30	10 20 35	19 0 0	50 23 5	11

## ALLOTMENTS OF FUNDS.

August 15, 1884 .....	\$1,000.00	July 21, 1892 .....	\$34,017.86
September 1, 1884 .....	4,000.00	July 21, 1893 .....	23,574.72
November 3, 1884 .....	4,500.00	July 23, 1894 .....	25,664.00
December 20, 1884 .....	500.00	July 12, 1895 .....	20,372.40
June 1, 1885 .....	100.00	July 28, 1896 .....	19,232.84
July 22, 1885 .....	1,000.00	July 15, 1897 .....	<sup>a</sup> 13,070.87
July 10, 1886 .....	1,200.00	August 2, 1897 .....	<sup>b</sup> 119,734.49
March 1, 1887 .....	1,100.00	October 8, 1897 .....	125.00
July 1, 1887 .....	11,000.00	September 1, 1898 .....	<sup>c</sup> 197,627.93
July 11, 1888 .....	6,270.00	August 14, 1899 .....	169,838.00
October 27, 1888 .....	3,000.00	September 7, 1900 .....	175,474.96
July 17, 1889 .....	1,480.00	August 5, 1901 .....	159,266.46
October 7, 1889 .....	1,500.00	July 26, 1902 .....	237,963.86
November 6, 1889 .....	1,200.00		
July 24, 1890 .....	12,300.00	Total .....	1,270,363.39
July 8, 1891 .....	24,250.00		

*Classified statement of expenditures incurred in operating and care of Monongahela River locks and dams during the fiscal year ending June 30, 1903.*

Item.	Amount.
Salaries and wages .....	\$134,044.86
Miscellaneous supplies and services .....	2,785.00
Dam, lock, and boat-yard supplies .....	21,800.00
Repair plant .....	8,189.50
Rebuilding, dredging, and removing obstructions .....	71,997.28
Total .....	238,816.16

## ABSTRACT OF CONTRACTS IN FORCE.

*Building an office building and a lockmaster's dwelling at Lock No. 4, Monongahela River.*

Contractor: Charleroi Lumber Company, Charleroi, Pa.

Rates:

Office, \$1,170.

Dwelling, \$2,950.

Date of approval.<sup>d</sup>

Date of beginning: December 18, 1902.

Dates of expiration:

Office, February 1, 1903.

Dwelling, March 1, 1903.

<sup>a</sup> Locks 8 and 9.

<sup>b</sup> Locks 1 to 7, inclusive.

<sup>c</sup> Locks 1 to 9, inclusive.

<sup>d</sup> Emergency.

*Building an office at each of Locks Nos. 8 and 9, Monongahela River, and additions to dwelling at Lock No. 9, Monongahela River.*

Contractors: Darrah Brothers, Morgantown, W. Va.

Rates:

Office at Lock No. 8, \$800.

Office at Lock No. 9, \$800.

Additions to dwelling at Lock No. 9, \$987.

Date of approval.<sup>a</sup>

Date of beginning: March 10, 1903.

Date of expiration: June 30, 1903.

*Building a dwelling at Lock No. 7, Monongahela River, and additions to dwelling at Lock No. 8, Monongahela River.*

Contractor: George B. Darrah, Morgantown, W. Va.

Rates:

Dwelling at Lock No. 7, \$2,500.

Additions to dwelling at Lock No. 8, \$1,000.

Date of approval.<sup>a</sup>

Date of beginning: March 17, 1903.

Date of expiration: July 31, 1903.

*Building two marine steel boilers and placing same on new U. S. repair boat Slackwater.*

Contractor: James Rees & Sons Company, Pittsburg, Pa.

Rate: \$2,650.

Date of approval.<sup>a</sup>

Date of beginning: March 15, 1903.

Date of expiration: April 1, 1903.

#### COMMERCIAL STATISTICS.

*Lockages made and traffic passed at Monongahela River locks during year ending June 30, 1903.*

At dams—	Lockages.		Steamboats.		Coalboats, barges, flats, and boat bottoms.		Rafts.	
	Up.	Down.	Up.	Down.	Up.	Down.	Up.	Down.
	<i>Number.</i>	<i>Number.</i>	<i>Number.</i>	<i>Number.</i>	<i>Number.</i>	<i>Number.</i>	<i>No.</i>	<i>No.</i>
1 .....	11,347	11,003	7,767	7,774	16,451	16,755	426	22
2 .....	11,161	10,823	6,620	6,626	20,138	20,390	281	35
3 .....	10,263	10,176	5,928	5,924	24,255	24,214	119	85
4 .....	9,267	9,099	5,173	5,197	20,639	20,385	47	81
5 .....	3,360	3,559	2,580	2,580	2,351	2,327	5	105
6 .....	1,468	1,550	1,139	1,152	855	862	15	95
7 .....	894	947	690	687	419	388	15	91
8 .....	880	956	694	698	417	398	4	108
9 .....	667	712	578	574	376	396	.....	57
Aggregate .....	49,305	48,825	31,169	31,212	86,401	86,525	912	679

At dams—	Other craft.		Coal.		Coke.		Rails, steel.	
	Up.	Down.	Up.	Down.	Up.	Down.	Up.	Down.
	<i>Number.</i>	<i>Number.</i>	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>
1 .....	647	686	29,240	5,689,840	.....	4,775	59	49,268
2 .....	418	457	16,100	7,916,590	.....	150	159	5
3 .....	242	250	1,728	8,959,832	.....	.....	112	5
4 .....	221	176	360	7,373,152	.....	150	112	.....
5 .....	235	242	276	685,146	.....	.....	102	3
6 .....	64	40	144	141,880	.....	.....	95	.....
7 .....	116	92	234	52	.....	.....	60	.....
8 .....	116	106	214	52	.....	.....	1	.....
9 .....	41	46	168	166	.....	.....	27	.....
Aggregate .....	2,100	2,095	48,454	30,766,710	.....	5,075	727	49,281

<sup>a</sup>Emergency.

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Lockages made and traffic passed at Monongahela River locks during year ending June 30, 1903—Continued.

At dams—	Other iron prod- ucts.		Sand.		Gravel.	
	Up.	Down.	Up.	Down.	Up.	Down.
	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>
1	6,135	32,905	270,793	34,655	539,552	9,310
2	4,374	5,828	56,519	137,446	365,343	6,780
3	6,106	3,000	56,069	199,435	150,276	414
4	14,106	384	14,759	483	58,930	-----
5	5,408	539	5,171	207	59,118	-----
6	1,467	352	2,484	683	46,276	483
7	1,193	700	138	-----	39,381	-----
8	1,017	624	156	152	40,209	-----
9	941	15,564	5,489	81	25,465	152
Aggregate	40,747	59,806	411,578	373,142	1,324,550	17,139

At dams—	Stone.		Brick.		Timber.	
	Up.	Down.	Up.	Down.	Up.	Down.
	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>
1	2,512	1,194	161	30	73,790	2,701
2	1,429	3,318	120	1	42,355	4,023
3	1,318	677	68	6	19,811	17,699
4	659	792	849	60	8,750	18,823
5	544	8,812	2,034	435	91	17,531
6	-----	794	112	471	697	16,621
7	-----	520	91	451	331	13,391
8	-----	794	-----	459	221	12,780
9	-----	118	-----	703	138	9,634
Aggregate	6,462	17,019	3,435	2,616	146,193	113,203

At dams—	Lumber.		Laths.		Posts.	
	Up.	Down.	Up.	Down.	Up.	Down.
	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>
1	25,961	1,120	330	-----	31,860	21
2	20,111	1,042	158	-----	31,707	32
3	8,637	1,061	135	-----	30,065	436
4	2,964	865	46	17	13,115	780
5	3,789	2,228	79	3	351	3,585
6	1,165	2,141	34	3	-----	3,804
7	289	2,268	-----	3	400	2,821
8	142	1,965	-----	11	1	3,509
9	79	1,952	-----	4	-----	3,325
Aggregate	63,167	14,642	782	41	107,499	18,373

At dams—	Braces.		Ties, rail- road.		Wood.		General mer- chandise.	
	Up.	Down.	Up.	Down.	Up.	Down.	Up.	Down.
	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>
1	940	-----	1,400	50	2	-----	23,011	19,291
2	1,660	208	620	-----	-----	3	22,545	10,689
3	20	140	2,150	-----	-----	-----	22,922	6,052
4	-----	20	730	-----	-----	-----	20,828	5,974
5	-----	10	160	1,300	-----	-----	17,948	5,217
6	4	4	-----	1,660	-----	-----	12,050	4,630
7	-----	-----	-----	2,000	54	2	7,047	2,996
8	-----	-----	17,461	-----	335	-----	5,511	2,358
9	-----	-----	300	2,240	-----	-----	4,459	2,247
Aggregate	2,624	382	5,300	24,801	56	340	136,321	59,454

*Lockages made and traffic passed at Monongahela River locks during year ending June 30, 1903—Continued.*

At dams—	Farm, dairy, and orchard products.		Live stock, large.		Live stock, small.		Passengers.	
	Up.	Down.	Up.	Down.	Up.	Down.	Up.	Down.
	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>
1.....	5,023	346	506	261	19	107	48,173	47,148
2.....	4,844	361	535	376	13	100	51,859	49,598
3.....	4,738	408	509	327	16	90	30,965	28,578
4.....	4,235	507	399	245	2	106	21,216	20,764
5.....	2,527	491	228	149	2	121	38,988	37,985
6.....	1,940	355	163	150	.....	132	17,690	17,046
7.....	1,042	158	109	87	.....	8	12,680	12,567
8.....	757	127	88	80	.....	2	12,004	11,236
9.....	635	88	84	79	.....	1	9,626	9,056
Aggregate .....	25,741	2,841	2,621	1,754	52	667	243,201	233,978

*Total commerce of the river.*

Fiscal year—	Products.	Passengers.
	<i>Tons.<sup>a</sup></i>	<i>Number.</i>
1902.....	9,100,887	181,527
1903.....	11,369,814	101,457

<sup>a</sup>2,000 pounds.

The total commerce on the Monongahela River is obtained by summing up the maximum tonnage of the several kinds of freight passing any single dam. The coal item in this total is that passed down through Lock No. 3, plus that mined in the first and second pools.

#### G G 4.

##### IMPROVEMENT OF HARBOR AT PITTSBURG, PENNSYLVANIA.

*Dredging channel.*—The project for dredging in the harbor was modified August 11, 1902, to provide a widening of the proposed dredged channel at the Pittsburg, Cincinnati, Chicago and St. Louis Railroad bridge across the Monongahela River at Try street, Pittsburg. Reconstruction of the bridge made necessary the increase of the width of the dredged cut at the bridge from 220 feet to 550 feet. This work was started September 4, 1902, and completed March 6, 1903; 89,776 cubic yards were excavated.

*Removal of abandoned structures, etc.*—The recommended change of harbor line at the coke ovens of Jones & Laughlins, Limited, on the Monongahela River, near Hazlewood, which involves the removal of a projecting slag-filled point, was approved by the Department August 15, 1902.

The projecting point is to be removed by Jones & Laughlins within two years from that date.

*Marking harbor lines, inspection and patrol.*—The established harbor lines were marked by lettered posts, etc., as follows: In the Allegheny River, on both banks from the mouth to the Sixteenth Street Bridge, 2½ miles. In the Monongahela River, on both banks from the Pittsburg and Lake Erie Railroad bridge at Homestead to Dam No. 2, 3 miles, except some parts which had been marked in

preceding year. The modified harbor line at the Jones & Laughlins coke ovens, from near Four-Mile Run to Hazlewood avenue was also marked by brass plates, posts, etc.

On the Monongahela River the harbor lines have now been marked from the mouth to Dam No. 2, and at some places above, leaving but about 5 miles still to be marked of the 31 miles of established lines on the river below McKeesport.

On the Allegheny River the lines are marked from the mouth to the Sharpsburg Bridge and at a few places above the bridge, leaving only about 2 miles of the 17.2 miles of established lines on this river yet to be marked.

Completion of the marking of the established lines was prevented by work necessary for extension of the harbor lines down the Ohio River below Davis Island dam and up the Monongahela River above McKeesport.

Patrol of the harbor was maintained, resulting in removal of improper deposits and stopping violations of laws for protection of navigable waters in a large number of cases. Inspection of permit works and other construction near the banks and supervision of the work of sand dredgers was continued.

*Changes of harbor lines.*—After investigation and recommendation by this office, the following changes of harbor line were approved by the Secretary of War on the dates named:

Pittsburg wharves on Monongahela and Allegheny rivers May 29, 1903.

Left bank Allegheny River, near Pine Creek, May 9, 1903.

Right bank Monongahela River, Four Mile Run to near Hazlewood avenue, August 15, 1902.

*Extension of harbor lines.*—On petition of the Clairton Steel Company and other property owners, harbor lines were established on the Monongahela River from Elizabeth to Wilson, 3 miles.

Maps were furnished by the petitioners, which were used in connection with a triangulation survey by this office.

A public hearing of the proposed lines was held October 3, 1902. The maps and description of the lines were completed in January, 1903, and the lines were approved by the Secretary of War on February 3, 1903.

On petition of the Pittsburg Coal Exchange the establishment of harbor lines on the Ohio River from Davis Island dam through pools 2 and 3, including the back channel around Neville Island, was authorized July 18, 1902.

It was found that the maps made five and six years ago were not sufficiently accurate for the purpose, also many changes and additions in topographical features had been made so that considerable new survey work was necessary.

An accurate system of triangulation was located on the main channel from Davis Island dam to Dam No. 3, a distance of 7 miles, requiring 46 stations. A transit line with carefully measured distances and angles 4.6 miles long was run along left bank of the back channel and connected at intervals by lines across Neville Island with the triangulation system on the main river channel.

A map of the reach, in 9 sheets, has been made on heavy drawing paper and two sets of tracings of the sheets are nearly completed.

Tentative harbor lines have been laid down and a public hearing on the lines as proposed will be held July 13, 1903.



On petition of the Pittsburg Steel Foundry Company and in accordance with Department instruction dated January 7, 1903, harbor lines are to be established on the Monongahela River from McKeesport to Wilson, 4 miles, which will make the harbor lines on this river continuous from the mouth to Elizabeth, 23 miles. Maps were furnished by the petitioners covering the part of the reach from Wilson to Otto,  $2\frac{1}{2}$  miles. Triangulation was extended from McKeesport to Wilson, 4 miles, and bank topography and soundings were taken from the Dravosburg Bridge to Otto, 1 mile. Some preliminary mapping of the work was done.

*Changing obstructive bridges, Allegheny River.*—Complaint having been received that the Union Bridge at mouth of the Allegheny River was an unreasonable obstruction to navigation, a report recommending certain changes in the bridge was sent to the Department October 13, 1902. The usual public hearing for general consideration of the matter was ordered, and hearings were held November 14 and 28, 1902. On January 20, 1903, the Secretary of War ordered that the bridge be changed as recommended and notice to that effect was served on the bridge company January 26, 1903.

Similar complaint having been made against the Sixth Street Bridge, report on same was made by this office on October 7, 1902. Public hearing regarding this bridge was held November 29, 1902 (postponed from November 15). Report of the proceedings, accompanied by a large number of papers, drawings, photographs, etc., submitted by the various parties interested, together with the conclusions and recommendations of this office, was forwarded on February 14, 1903.

Reports on complaints against the Seventh and the Ninth street bridges were forwarded April 11, 1903, and public hearings for consideration of recommended changes were held on June 1 and 2, 1903, respectively. Similar proceedings were taken against other Allegheny River bridges, and public hearings for consideration of recommended changes were held as follows:

Pittsburg, Fort Wayne and Chicago Railroad, June 3, 1903.

Sixteenth Street Bridge, June 6, 1903.

Thirtieth Street Bridge, June 9, 1903.

Pittsburg Junction Railroad Bridge, June 11, 1903.

Forty-third Street Bridge, June 13, 1903.

*Miscellaneous.*—Other public hearings in addition to those mentioned above were held as follows:

New bridge by West Pennsylvania Railroad Company, over back channel at foot of Herr Island, November 17, 1902.

Extension of Baltimore and Ohio Railroad passenger station beyond harbor lines at foot of Smithfield street, November 22, 1902.

New bridge by Western Bridge Company over Ohio River at McKees Rocks, January 24, 1903.

New bridge over Allegheny River, by Pennsylvania Railroad at Brilliant, February 21, 1903.

New bridge over Allegheny River by Pittsburg, Carnegie and Western Railroad, near Fourth street.

Reports were made on 28 applications for permits for miscellaneous structures in the river beyond the harbor lines.

A set of tracings of the map, in seven sheets, showing the harbor lines on Monongahela River from Homestead to McKeesport, and a description of the lines were made and forwarded to the Department on August 29, 1902.

# 1670 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

## Money statement.

July 1, 1902, balance unexpended.....	\$47,029.19
June 30, 1903, amount expended during fiscal year .....	33,542.90
July 1, 1903, balance unexpended.....	13,486.29
July 1, 1903, outstanding liabilities .....	1,144.58
July 1, 1903, balance available.....	12,341.71
{ Amount that can be profitably expended in fiscal year ending June 30, 1905, for maintenance of improvement, in addition to the balance unexpended July 1, 1903 ..... 10,000.00 Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

## APPROPRIATIONS.

March 3, 1899.....	\$110,662.90
June 13, 1902.....	10,000.00
Total.....	120,662.90

## ABSTRACT OF CONTRACTS IN FORCE.

### *Dredging and removing obstructions in the Monongahela River between the Tenth Street and Smithfield Street bridges, Pittsburg.*

Contractor: Monongahela and Western Dredging Company, Pittsburg, Pa.

Rates: Dredging and disposal of dredgings by dumping in the river, 17.9 cents per cubic yard; dredging and disposal of dredgings outside the river, 53 cents per cubic yard; removing obstructions, \$12 per hour.

Date of approval:<sup>a</sup>

Date of beginning work: November 20, 1902.

Date of expiration: March 20, 1903.

## COMMERCIAL STATISTICS.

### *Classified statement of river traffic in Pittsburg Harbor for calendar year 1902.*

Commodities.	Tons. <sup>a</sup>	Commodities.	Tons. <sup>a</sup>
Barges, new.....	8,340	Piles.....	5,308
Bark, tan.....	864	Pig iron.....	3,435
Bottoms, coal-boat, new.....	30,384	Poles, brace.....	3,048
Battens, boat.....	77	Posts:	
Bricks.....	34	Pit.....	40,459
Coal.....	9,357,345	Check.....	1,519
Coke.....	2,850	Sand.....	1,339,832
Flats, new.....	1,184	Shingles.....	79
Farm, dairy, and orchard produce..	50,285	Steel rails.....	75,353
General merchandise.....	78,923	Steel and iron products, miscellane-	
Gravel.....	837,789	ous.....	137,654
Laths.....	633	Stone.....	23,990
Lumber.....	58,023	Ties, railroad.....	1,250
Live stock:		Timber.....	170,927
Large.....	7,167	Wood.....	60
Small.....	1,698	Total.....	12,252,405
Manure.....	3,620	Passengers..... number..	906,500
Miscellaneous.....	450		
Machinery.....	350		
Pipe, sewer.....	500		

<sup>a</sup>2,000 pounds.

NOTE.—In preparing this statement care was taken not to duplicate any items. It should be stated that at least eight-tenths of this commerce is stored in the harbor from a week to several months and then rehandled and shipped out and the empties returned. The rehandling and return of empties are not considered in the table.

<sup>a</sup>Emergency contract.

## G G 5.

OPERATING AND CARE OF DAVIS ISLAND DAM, OHIO RIVER, NEAR  
PITTSBURG, PENNSYLVANIA.

The new service bridge for Weir No. 3, delivered by the contractors in the spring of 1902, was erected by the permanent lock force in September, 1902.

The steam launch *Wenonah* and maneuvering boat were docked and renovated and their hulls were painted. A new deck was put on the maneuvering boat.

The signal lamps were lost during the rise of March 1, 1903.

Plans and specifications for rebuilding the dam across the back channel at Davis Island have been prepared and submitted to the Chief of Engineers. The dam proposed is a fixed dam to a height of 7 feet above the sill of the navigable pass; that portion above this height is the Chittenden drum weir type.

The fuel used for the lock-gate boilers was changed from coal to natural gas satisfactorily, and with a great saving of labor and at no greater expense.

The rotten timber floors in lock-gate boiler houses were replaced by concrete floors. Removable coverings for each lock-gate engine have been erected.

Two hundred and seventy-eight feet more of the new concrete upper guide wall were built, together with the drift chute and brick drain, completing the contract for same. The quantities of work accomplished are as follows:

736.8 cubic yards common excavation.  
6.9 cubic yards rock excavation.  
808.85 cubic yards concrete masonry.  
300 pounds wrought iron and steel.

The contract for rebuilding lower guide wall was completed. The quantities of work done are as follows:

202 linear feet cofferdam.  
916.65 cubic yards common excavation.  
208.55 cubic yards rock excavation.  
1,328.50 cubic yards concrete masonry  
104.10 cubic yards brick masonry.  
625 pounds cast iron.  
600 pounds wrought iron.  
50 pounds steel.  
686 pounds bolts, etc.

During the year the dam was raised and lowered several times, as follows:

Raised.	Lowered.	Time up. Days.
July 18, 1902.....	July 21, 1902.....	3
Aug. 7, 1902.....	Oct. 12, 1902.....	66
Oct. 16, 1902.....	Nov. 26, 1902.....	41
Dec. 2, 1902.....	Dec. 3, 1902.....	1
May 8, 1903.....	May 28, 1903.....	25
May 29, 1903.....	June 14, 1903.....	17
June 18, 1903.....	June 23, 1903.....	5
Total.....	.....	158

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## ALLOTMENT OF FUNDS.

August 3, 1885 .....	\$5,865.00	July 28, 1896 .....	\$15,531.57
July 10, 1886 .....	12,015.00	May 17, 1897 .....	1,200.00
January 28, 1887 .....	6,700.00	July 23, 1897 .....	9,898.63
July 1, 1887 .....	12,355.00	November 20, 1897 .....	400.00
February 25, 1888 .....	3,500.00	July 26, 1898 .....	9,620.71
July 11, 1888 .....	18,015.00	February 7, 1899 .....	3,000.00
August 20, 1889 .....	12,073.00	June 24, 1899 .....	1,200.00
May 14, 1890 .....	2,000.00	July 19, 1899 .....	23,459.69
July 17, 1890 .....	14,752.00	January 13, 1900 .....	3,230.00
October 7, 1890 .....	14,800.00	June 18, 1900 .....	45,000.00
July 10, 1891 .....	10,338.00	July 17, 1900 .....	47,458.07
July 21, 1892 .....	11,831.48	February 26, 1901 .....	2,000.00
June 27, 1893 .....	1,300.00	June 28, 1901 .....	10,000.00
July 22, 1893 .....	12,253.82	July 18, 1901 .....	42,580.54
July 18, 1894 .....	12,459.02	August 8, 1902 .....	23,889.09
May 25, 1895 .....	450.00		
July 9, 1895 .....	30,661.54	Total .....	\$419,785.15

*Classified statement of expenditures incurred in operating and care of the Davis Island Dam, Ohio River, during the fiscal year ending June 30, 1903.*

Item.	Amount.
Salaries and wages .....	\$11,000.98
Miscellaneous supplies and services .....	3,553.91
Rebuilding Weir No. 3 .....	28,712.90
Total .....	43,267.74

COMMERCE PASSING DAVIS ISLAND DAM, OHIO RIVER, DURING FISCAL YEAR ENDING JUNE 30, 1903.

	Number.	Tons. <sup>a</sup>
Packets .....	447	.....
Towboats .....	2,858	.....
Model barges .....	128	.....
Coal boats .....	3,946	.....
Barges .....	5,777	.....
Flats .....	2,985	.....
Rafts .....	16	.....
Miscellaneous craft .....	521	.....
Coal .....	.....	4,423,676
Iron and steel products .....	.....	107,060
Sand .....	.....	17,000
Gravel .....	.....	84,000
Miscellaneous .....	.....	143,212
Totals .....	16,673	4,724,938

<sup>a</sup>2,000 pounds.

## G G 6.

CONSTRUCTION OF LOCKS AND DAMS NOS. 2 TO 7, INCLUSIVE, OHIO RIVER, IN PENNSYLVANIA.

*Dam No. 2.*—Two contracts are in force at this dam with the Evansville Contract Company, dated September 20, 1902, and September 18, 1902. That dated September 20, 1902, is for paving the slopes on

<sup>a</sup>Of this amount there was undrawn or deposited \$1,010.

the esplanade; work has not been commenced under this contract. That dated September 18, 1902, is for dredging a channel 200 feet wide and about 4,000 feet long, so as to enable navigation to pass over that portion of the navigable pass already completed. Under this contract about 7,736 cubic yards of sand and gravel have been removed, the same being about 12 per cent of the total required.

During the year the contract for constructing 500 feet of Chanoine dam, under contract with the same contractor dated April 29, 1901, was completed, and the false work removed from the river.

The materials furnished and placed and work done by the contractor during the year were as follows:

Common excavation .....	cubic yards..	994
Rock excavation .....	do .....	532.69
Bolt holes in masonry .....	lineal feet..	314.20
Removal of Merriman's dike .....	do .....	680
Stone filling .....	cubic yards..	495.60
Gravel filling .....	do .....	627
Concrete .....	do .....	2,438.80
Oak timber (permanent) .....	feet B. M. ..	327,734
Hemlock timber (permanent) .....	do .....	720
Cast iron .....	pounds .....	151,494
Wrought iron and steel .....	do .....	191,657
Bolts, nuts, etc. ....	do .....	88,858
Wrought-iron pipe, 3-inch .....	linear feet..	652
Wrought-iron pipe, 4-inch .....	do .....	322

*Dam No. 3.*—Work in progress consists in dredging, by contract, a channel 300 feet wide and about 5,000 feet in length for use during construction of navigable pass. This contract, dated June 2, 1902, is with the Monongahela and Western Dredging Company. About 120,000 cubic yards of gravel were to be dredged, and the work is about completed.

Plans and specifications for the construction of 600 feet of the navigable pass, exclusive of the wickets, have been prepared and approved, and bids for the construction of the same are now being advertised for.

It will cost \$40,000, not covered by any existing projects, to properly protect the walls and guide walls of this lock.

*Dam No. 4.*—Under a contract with the Ætna Construction Company, dated July 6, 1901, 500 feet of the navigable pass is being built. About one-fifth of the permanent work under this contract has been completed.

The materials furnished and placed and work done during the year were as follows:

Cofferdam .....	linear feet..	100.50
Stone filling .....	cubic yards..	517.78
Esplanade filling .....	do .....	14,240.57
Hemlock timber .....	feet B. M. ..	478.60
Channel dredging .....	cubic yards..	11,449.32
Oak timber (permanent) .....	feet B. M. ..	2,755.90
Bolts, nuts, etc. ....	pounds .....	12,191.90
Gravel filling .....	cubic yards..	655.81
Round piling .....	linear feet..	354
Sheet piling .....	do .....	1,566
Concrete masonry .....	cubic yards..	1,711.52
Oak timber (permanent) .....	feet B. M. ..	45,472.63
Cast iron .....	pounds .....	24,435.75
Common excavation .....	cubic yards..	1,176.77
Bolt holes in masonry .....	linear feet..	11.50
Wrought-iron pipe, 3-inch .....	do .....	226.67
Wrought-iron pipe, 4-inch .....	do .....	114.17

A contract with last-named company, dated November 26, 1902, for paving with brick the area above the upper-lock gate recess, was completed in March, 1903. Two thousand and thirteen square yards of paving were placed.

It will cost \$40,000, not covered by any existing projects, to properly protect the walls and guide walls of this lock.

*Dam No. 5.*—No work was in progress and no contracts were in existence at this lock at the beginning of the fiscal year.

A contract was entered into with Robert A. Cummings August 16, 1902, for the construction of the substructure of 400 feet of Chanoine dam. Work under this contract commenced October 17, 1902. The cofferdam was practically completed November 30, 1902, and about 65 per cent of the excavation for foundation of dam was executed.

The materials furnished and placed and work done under this contract by Robert A. Cummings during the year were as follows:

Hemlock timber.....	feet B. M.	163,735.9
Round piling.....	linear feet	13,763.5
Stone filling.....	cubic yards	801.8
Common filling.....	do.	9,361.44
Common excavation.....	do.	8,070.66
Iron and steel.....	pounds	12,672.2
Wire rope.....	linear feet	125

During the past winter 390 feet of the lower arm of the cofferdam (about 90 per cent of said arm) was carried away by the floods. All the filling in the remaining 60 feet of the lower arm and 90 per cent of the filling in outer arm was washed out.

Repairs to the cofferdam commenced June 10, 1903, and are now in progress. About 400 cubic yards of additional heavy riprap was deposited in April around outer arm of cofferdam to save it.

During the winter floods the lock chamber was badly scoured, washing out a large portion of the floor below the center of lock and undermining the land and river walls of the lock. The maximum depth of scour for a short distance along the land wall was about 30 feet below sill, or practically to bed rock. The land wall has settled and bulged outward for a length of about 160 feet. The foundation appears to be gone entirely for a part of this distance, and it will be necessary to rebuild this portion of the land wall. The river wall shows no settlement, but the scour on both sides was below the foundation for some distance. As soon as these conditions were discovered arrangements were made to arrest further damage by depositing riprap stone along the walls.

Under oral agreement with Robert A. Cummings, 1,979½ cubic yards of stone filling and 20 cubic yards of gravel filling were deposited on the river and lock sides of the river wall, filling up to about 6 feet above the bottom of foundation, and along the land wall above and below the damaged portion, and below the upper gate track for a distance of about 60 feet.

Under oral agreement with the Evansville Contract Company, 540 cubic yards of stone filling were deposited along the river wall in lock chamber around the spill crib and below the deep scour to prevent any further spread of the scour.

Under oral agreement with the Aetna Construction Company the coping was removed from the damaged portion of land wall and 750 cubic yards of gravel were removed from behind the wall to prevent it from falling over into the lock chamber.

Preparations were commenced May 18 to repair the lock walls by *hired labor*. A plant has been borrowed from other works in the dis-

trict and has been partially repaired and installed. Fifty-two piles have been driven in the lock chamber for a foundation for a pumping plant. Material has been ordered for the necessary cofferdams.

The following is a statement of cost and work done for protection and maintenance of lock walls and lock chamber:

## ORAL AGREEMENT WITH ROBERT A. CUMMINGS.

Quantity.	Kind.	Rate.	Amount.
1,979½ cubic yards.....	Stone filling .....	<i>Cu. yd.</i> \$3.50	\$6,927.55
20 cubic yards .....	Gravel filling.....	1.15	23.00

## ORAL AGREEMENT WITH AETNA CONSTRUCTION COMPANY.

750 cubic yards .....	Dredging behind wall ....	\$0.20	\$150.00
100 cubic yards .....	Coping removed.....	1.25	125.00

## ORAL AGREEMENT WITH EVANSVILLE CONTRACT COMPANY.

540 cubic yards .....	Stone filling .....	\$2.50	\$1,350.00
-----------------------	---------------------	--------	------------

Grand total, \$8,575.55.

The rebuilding of that portion of the land wall destroyed by the floods will cost about \$60,000, and the work necessary to protect the entire lock from injurious scour in the future will cost about \$40,000.

*Dam No. 6.*—The river and harbor act of June 13, 1902, provided for the completion of this lock and dam, and since the beginning of the fiscal year the following work has been done:

Under contract dated September 20, 1902, with the Evansville Contract Company, the two piers which were only partially completed last year have been practically completed, and some excavation has been done on site of abutment.

A contract for the power house has been entered into with the W. W. Wood Company, of Wheeling, W. Va., but no work has been begun.

Plans and specifications have been prepared for the two lock masters' houses.

Contract for the lock gates has been entered into with the Penn Bridge Company, of Beaver Falls, Pa.

The necessary machinery for operating the lock is being put in place as rapidly as possible.

The wickets of the Chanoine dam have been repaired. The maneuvering boat is nearly completed.

The A-frame dam is being raised for necessary modification. The recess walls have been built up to the required height to receive the decking, and retaining walls in rear of each recess have been completed. The lock-gate engine foundations are nearly completed. The power house foundation was built up of concrete about 12 feet.

It is expected to place this lock in operation during the summer of 1904, but it will then be incomplete, the funds available being insufficient on account of increased cost arising from increase in price of material and labor.

A large amount of dredging in the lock approaches and above the dam and weirs is necessary before the lock can be fully utilized, and for which work there is as yet no provision. About 85 per cent of the work is completed.

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*Dam No. 7.*—Authorized by river and harbor act of June 13, 1902.

A contract was entered into July 31, 1902, with the Preslar-Crawley Manufacturing Company, of Cincinnati, Ohio, for drilling test holes at the site. Work was begun August 26, 1902, and completed June 30, 1903.

During the fall of 1902 a survey was made of the river from a point about 35 miles below Pittsburg (foot of Phyllis Island) to a point 2 miles farther down for the purpose of choosing a site. At the chosen site rock foundation was secured for the lock walls.

Surveys were made of the property proposed to be acquired. About 17½ acres of land on the lock side and 4 acres on the abutment side have been selected as necessary for the building and operation of the lock and dam. Title for 13.02 acres of land on the lock side have been secured at a satisfactory price, but payment has not been made. It will be necessary to condemn the remainder of the property.

*Money statements.*

CONSOLIDATED.

July 1, 1902, balance unexpended.....	\$1,086,015.39
Amount appropriated by sundry civil act approved March 3, 1903....	300,000.00
	<hr/>
June 30, 1903, amount expended during fiscal year .....	1,386,015.39
	<hr/>
July 1, 1903, balance unexpended.....	1,079,580.04
July 1, 1903, outstanding liabilities.....	34,323.32
	<hr/>
July 1, 1903, balance available .....	1,045,256.72
July 1, 1903, amount covered by uncompleted contracts.....	310,376.72
	<hr/>
{ Amount (estimated) required for completion of existing project....	2,007,000.00
{ Amount that can be profitably expended in fiscal year ending June 30, 1905, for works of improvement in addition to the balance unexpended July 1, 1903.....	1,707,000.00
{ Submitted in compliance with requirements of sundry civil act of June 4, 1897.	

DAMS NOS. 2, 3, 4, AND 5.

July 1, 1902, balance unexpended.....	<sup>a</sup> \$887,722.04
Amount appropriated by sundry civil act approved March 3, 1903....	300,000.00
	<hr/>
June 30, 1903, amount expended during fiscal year .....	1,187,722.04
	<hr/>
July 1, 1903, balance unexpended.....	<sup>b</sup> 921,227.32
July 1, 1903, outstanding liabilities.....	12,330.59
	<hr/>
July 1, 1903, balance available .....	908,896.73
July 1, 1903, amount covered by uncompleted contracts.....	292,850.08
	<hr/>
{ Amount (estimated) required for completion of existing project....	1,180,000.00
{ Amount that can be profitably expended for works of improvement in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903.....	1,180,000.00
{ Submitted in compliance with requirements of sundry civil act of June 4, 1897.	

<sup>a</sup> The balance unexpended July 1, 1902, was erroneously reported in report of 1902 as \$1,187,722.04. It is noticed that \$400,000 was taken up as appropriated by act of June 13, 1902, instead of \$100,000. The remaining \$300,000 was pledged June 13, 1902, but not appropriated until March 3, 1903.

<sup>b</sup> Five hundred dollars was received during the year for sale of property to Lock 11, Ohio River.



## DAM NO. 6.

July 1, 1902, balance unexpended .....	\$175,293.35
June 30, 1903, amount expended during fiscal year .....	30,672.53
July 1, 1903, balance unexpended .....	<sup>a</sup> 144,620.82
July 1, 1903, outstanding liabilities .....	15,852.54
July 1, 1903, balance available .....	128,768.28
July 1, 1903, amount covered by uncompleted contracts .....	16,753.73

## DAM NO. 7.

July 1, 1902, balance unexpended .....	\$23,000.00
June 30, 1903, amount expended during fiscal year .....	9,268.10
July 1, 1903, balance unexpended .....	13,731.90
July 1, 1903, outstanding liabilities .....	6,140.19
July 1, 1903, balance available .....	7,591.71
July 1, 1903, amount covered by uncompleted contracts .....	772.96

(Amount (estimated) required for completion of existing project .....	827,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1905, for works of improvement, in addition to the balance unexpended July 1, 1903 .....	527,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897.	

## APPROPRIATIONS.

September 19, 1890, construction of Lock and Dam No. 6 .....	\$250,000
July 13, 1892, construction of Lock and Dam No. 6 and purchase of land for No. 2 .....	100,000
August 18, 1894, construction of Lock and Dam No. 6 .....	75,000
March 2, 1895, construction of Lock and Dam No. 6 .....	150,000
June 3, 1896:	
Construction of Lock and Dam No. 6 .....	25,000
Construction of Locks and Dams Nos. 2, 3, 4, and 5, and purchase of sites for Nos. 3, 4, and 5 .....	30,000
June 4, 1897:	
Construction of Dams Nos. 2, 3, and 4 .....	400,000
Construction of Dam No. 6 .....	300,000
July 1, 1898, continuing construction of Dams Nos. 2, 3, 4, and 5 .....	595,000
March 3, 1899, continuing construction of Dams Nos. 2, 3, 4, and 5 .....	400,000
June 6, 1900, continuing construction of Dams Nos. 2, 3, 4, and 5 .....	595,000
June 13, 1902:	
Continuing construction of Locks and Dams Nos. 2, 3, 4, and 5 .....	100,000
Completing Lock and Dam No. 6 .....	175,000
Construction of Lock and Dam No. 7 .....	23,000
March 3, 1903, continuing construction of Dams Nos. 2, 3, 4, and 5 .....	300,000
Total .....	3,518,000

<sup>a</sup> The Mercantile Trust Company during the year paid \$6,764.49 in compromise of suit brought by the Government against them as surety on failing contract of Hulings Brothers for building pass at Lock 6.

1678 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

ABSTRACT OF CONTRACTS IN FORCE.

*Drilling test holes at each of Dams Nos. 2, 3, 4, and 5, Ohio River.*

Contractor: The Preslar-Crawley Manufacturing Company, Cincinnati, Ohio.  
Rates: Drilling through loose material, \$2.50 per linear foot; drilling into rock, \$3.50 per linear foot.  
Date of approval:<sup>a</sup>  
Date of beginning work: May 15, 1902.  
Date of expiration: 90 fair working days.

*Constructing 500 linear feet of Chanoine Dam and its protection crib across the navigable pass at Dam No. 2, Ohio River.*

Contractor: The Evansville Contract Company, Evansville, Ind.  
Rates: Cofferdam, \$9 per linear foot; round piling, 40 cents per linear foot; sheet piling, 40 cents per linear foot; common excavation, 50 cents per cubic yard; rock excavation, \$3 per cubic yard; bolt holes in masonry, 50 cents per linear foot; channel dredging, 30 cents per cubic yard; removing Merriman's dike, \$10 per linear foot; stone filling, \$2 per cubic yard; gravel filling 60 cents per cubic yard; concrete, \$4 per cubic yard; oak timber (permanent), \$60 per M feet B. M.; hemlock timber (permanent), \$40 per M feet B. M.; cast iron, 4¢ cents per pound; wrought iron and steel, 4¢ cents per pound; bolts, nuts, washers, spikes, etc., 4¢ cents per pound; wrought-iron pipe, 3-inch diameter, 75 cents per linear foot; wrought-iron pipe, 4-inch diameter, \$1 per linear foot.  
Date of approval: May 28, 1901.  
Date of beginning work: July 31, 1901.  
Date of expiration: 150 fair working days (extended for a reasonable period).

*Dredging at Dam No. 2, Ohio River.*

Contractor: The Evansville Contract Company, Pittsburg, Pa.  
Rate: 39 cents per cubic yard.  
Date of approval: October 11, 1902.  
Date of beginning work: October 31, 1902.  
Date of expiration: 100 fair working days.

*Paving slopes on esplanade at Lock No. 2, Ohio River.*

Contractor: The Evansville Contract Company, Pittsburg, Pa.  
Rate: \$1.25 per square yard.  
Date of approval: October 13, 1902.  
Date of beginning work: November 1, 1902.  
Date of expiration: 50 fair working days.

*Dredging near Dam No. 3, Ohio River.*

Contractor: Monongahela and Western Dredging Company, Pittsburg, Pa.  
Rates:  
Dredging, 33 cents per cubic yard.  
Material deposited behind land wall at Lock No. 3, 22 cents per cubic yard.  
Date of approval: June 17, 1902.  
Date of beginning work: July 21, 1902.  
Date of expiration: March 21, 1903 (extended for a reasonable period).

*Constructing 500 feet of Chanoine Dam and its protection crib at Dam No. 4, Ohio River, and for modification of cofferdam.*

Contractor: Aetna Construction Company, Wheeling, W. Va.  
Rates: Original contract. Cofferdam, \$15 per linear foot; round piling, 30 cents per linear foot; sheet piling, 35 cents per linear foot; common excavation, 40 cents per cubic yard; rock excavation, \$1 per cubic yard; bolt holes, 50 cents per linear foot; stone filling, \$2.50 per cubic yard; gravel filling, 30 cents per cubic yard; esplanade filling, 35 cents per cubic yard; concrete masonry, \$3.50 per cubic yard; oak timber (permanent), \$45 per M feet B. M.; hemlock timber (permanent), \$25 per M feet B. M.; cast iron, 4 cents per pound; wrought iron and steel, 4 cents per

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<sup>a</sup>Emergency contract.

pound; bolts, nuts, washers, spikes, etc., 4 cents per pound; wrought-iron pipe, 3-inch diameter, 50 cents per linear foot; wrought-iron pipe, 4-inch diameter, 50 cents per linear foot. Channel dredging and bank protection: Channel dredging, 30 cents per cubic yard; round piling, 30 cents per linear foot; oak timber, \$45 per M feet B. M.; bolts, nuts, washers, etc., 4 cents per pound; stone filling, \$2 per cubic yard.

Rates: Supplemental contract. For so much material as would be required to construct a cofferdam 12 feet wide and 15 feet high (these being the average dimensions of the cofferdam provided for in the original contract), \$15 per linear foot; for all material in place in excess of the amount required to construct a cofferdam 12 feet wide and 15 feet high, hemlock timber, \$45 per M feet B. M.; bolts, nuts, and washers, 6 cents per pound; gravel filling, \$1.15 per cubic yard.

Date of approval: Original contract, July 18, 1901. Supplemental contract, May 26, 1902.

Date of beginning work: Original contract, September 20, 1901.

Date of expiration: Original contract, 250 fair working days. Supplemental contract, 60 additional days.

*Building about 400 feet of Chanoine Dam (excepting the movable parts), complete, for navigable pass of Dam No. 5, Ohio River.*

Contractor: Robert A. Cummings, Pittsburg, Pa.

Rates: Hemlock timber, \$35 per M feet B. M.; oak timber, \$70 per M feet B. M.; sheet piling, \$50 per M feet B. M.; round piling 50 cents per linear foot; stone filling \$3.50 per cubic yard; common filling 50 cents per cubic yard; common excavation, 50 cents per cubic yard; iron and steel, 4 cents per pound; wire rope, 7 cents per linear foot; wire-rope clips, 30 cents each; iron pipe, 2-inch, 35 cents per linear foot; iron pipe, 3-inch, 60 cents per linear foot; iron pipe, 4-inch, 80 cents per linear foot; concrete, \$7.50 per cubic yard.

Date of approval: September 18, 1902.

Date of beginning work: October 17, 1902.

Date of expiration: 200 fair working days.

*Building two masonry piers and south shore abutment of Dam No. 6, Ohio River.*

Contractor: The Evansville Contract Company, Pittsburg, Pa.

Rates: Brick masonry, \$15 per cubic yard; coping masonry, \$20 per cubic yard; ashlar masonry, \$12.50 per cubic yard; dimension stone, \$20 per cubic yard; common filling, 65 cents per cubic yard; common excavation, 65 cents per cubic yard; iron and steel, 5 cents per pound; iron pipe, 3-inch, 75 cent per linear foot; iron pipe, 4-inch, \$1 per linear foot; concrete \$7.50 per cubic yard; for stone furnished by the United States, \$10 per cubic yard, and for cement furnished by the United States, \$1.75 per barrel shall be deducted from moneys due or to become due the contractor.

Date of approval:<sup>a</sup>

Date of beginning work: October 20, 1902.

Date of expiration: 60 fair working days (extended for a reasonable period).

*Furnishing Atlas Portland cement for Dams Nos. 4 and 6, Ohio River.*

Contractor: Atlas Portland Cement Company, New York, N. Y.

Rates: F. o. b. cars Legionville, Pa., \$2.34 per barrel; f. o. b. cars Merrill, Pa., \$2.34 per barrel.

Date of approval: May 15, 1903.

Date of beginning work: 15 days after date of order.

Date of expiration: December 31, 1903.

*Furnishing cover plates, Dam No. 6, Ohio River.*

Contractor: John P. McGuire, Cleveland, Ohio.

Rate: \$995.

Date of approval:<sup>a</sup>

Date of beginning work: March 7, 1903.

Date of expiration: April 21, 1903.

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<sup>a</sup> Emergency contract.

1680 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

*Drilling test holes in the Ohio River at or near \* \* \* the proposed sites for  
Locks and Dams Nos. 7 \* \* \*.*

Contractor: The Preslar-Crawley Manufacturing Company, Cincinnati, Ohio.

Rates:

Drilling through loose material, \$3 per linear foot.

Drilling through hard material, \$5 per linear foot.

Date of approval:<sup>a</sup>

Date of beginning work: August 26, 1902.

Date of expiration: 150 fair working days.

*Furnishing and delivering one hoisting engine at Dam No. 6, Ohio River.*

Contractor: American Hoist and Derrick Company, St. Paul, Minn.

Rate: \$1,235.

Date of approval:<sup>a</sup>

Date of beginning work: February 27, 1903.

Date of expiration: March 29, 1903.

*Paving slopes on esplanade at Lock No. 4, Ohio River.*

Contractor: Aetna Construction Company, Wheeling, W. Va.

Rate: \$1.25 per square yard.

Date of approval: December 10, 1902.

Date of beginning work: December 31, 1902.

Date of expiration: 50 fair working days.

G G 7.

CONSTRUCTION OF LOCKS AND DAMS AT HERR ISLAND, ABOVE  
HEAD OF SIX MILE ISLAND, AND AT SPRINGDALE, ALLEGHENY  
RIVER.

A detailed description of the work done during the fiscal year ending June 30, 1903, will be found in the attached report of Assistant Engineer J. W. Arras.

*Money statement.*

July 1, 1902, balance unexpended.....	\$429,255.29
June 30, 1903, amount expended during fiscal year .....	108,976.18
July 1, 1903, balance unexpended.....	320,279.11
July 1, 1903, outstanding liabilities .....	5,249.49
July 1, 1903, balance available .....	315,029.62
July 1, 1903, amount covered by uncompleted contracts .....	295,842.77
Amount (estimated) required for completion of existing project.....	(b)

APPROPRIATIONS.

August 5, 1886.....	\$37,500	June 4, 1897 .....	\$350,000
August 11, 1888.....	35,000	July 1, 1898.....	300,000
September 19, 1890.....	35,000	March 3, 1901.....	126,000
July 13, 1892.....	40,000	June 28, 1902.....	118,500
August 18, 1894.....	40,000		
June 3, 1896.....	50,000	Total.....	1,182,000

<sup>a</sup> Emergency contract.

<sup>b</sup> In report printed in H. Doc. No. 371, Fifty-seventh Congress, first session, it was estimated that the completion of this project will cost \$148,783 more than the limiting cost fixed by Congress.

## ABSTRACT OF CONTRACTS IN FORCE.

*Constructing two locks and dams on Allegheny River at Six-Mile Island (No. 2) and at Springdale (No. 3).<sup>a</sup>*

Contractors: Sloan, McIlvain &amp; Ott Bros., Allegheny, Pa.

Lock and dam No. 3.

Rates: Original contract. Lock and abutment. Grubbing and clearing, \$142; earth excavation, 12 cents per cubic yard; hardpan excavation, 75 cents per cubic yard; rock excavation, \$1.75 per cubic yard; embankment, \$2.19 per cubic yard; concrete of natural cement, \$4.18 per cubic yard; concrete of Portland cement, \$5.57 per cubic yard; stone filling in cribs, \$1 per cubic yard; stone paving of cribs, \$1.10 per square yard; stone paving of river bank, \$1.40 per square yard; white oak in gates, \$47 per M feet B. M.; white oak in quoins and sills, \$60 per M feet B. M.; white oak in cribs, abutments, and gate spars, \$44 per M feet B. M.; hemlock in cribs, \$19.50 per M feet B. M.; button-head driftbolts in cribs, 1.7 cents per pound.

Rates: Original contract. Dam. White oak timber, \$30 per M feet B. M.; hemlock timber, \$19.50 per M feet B. M.; white oak sheeting on back of dam, \$28 per M feet B. M.; riprap stone filling, \$1.07 per cubic yard; button-head driftbolts, 1.7 cents per pound; dredging foundation, 16 cents per cubic yard; refilling for dam, 15 cents per cubic yard; backing of dam, 15 cents per cubic yard; hemlock piles in place, \$4.32 each; hemlock sheeting and scantling in foundation, \$16 per M feet B. M.

Rates: Supplemental contract, covering additional work at the following prices: Oak piles, \$8.62 each; white oak lumber, \$40 per M feet B. M.; hemlock lumber, \$27.50 per M feet B. M.; button-head driftbolts, 3 cents per pound; protection stone below dam, \$2.25 per cubic yard; riprap stone filling, if any, \$1.20 per cubic yard; gravel filling in dam, 30 cents per cubic yard.

Date of approval:

Original contract, July 8, 1897.

Supplemental contract, July 13, 1901.

Date of beginning work: May 25, 1898.

Date of expiration: September 26, 1901 (extended for a reasonable period).

*Building a lockmaster's dwelling at Herr Island dam, Allegheny River.*

Contractor: Samuel H. McCain, Allegheny, Pa.

Rate: \$6,806.

Date of approval:<sup>b</sup>

Date of beginning work: November 11, 1902.

Date of expiration: Three months thereafter.

*Building a lock, two guide walls, a guard crib, and abutment for dam at Six-Mile Island, Allegheny River.*

Contractor: The Dravo Contracting Company, Pittsburg, Pa.

Rates: Rock excavation, \$1.10 per cubic yard; hard pan excavation, \$1.10 per cubic yard; gravel excavation, \$1.10 per cubic yard; concrete, \$7.10 per cubic yard; oak timber, \$62 per M feet B. M.; hemlock timber, \$46.50 per M feet B. M.; stone ballast, \$3.10 per cubic yard; paving, \$4.65 per square yard; driftbolts, 5 cents per pound.

Date of approval: January 8, 1903.

Date of beginning work: April 1, 1903.

Date of expiration: November 15, 1904.

## REPORT OF MR. J. W. ARRAS, ASSISTANT ENGINEER.

*Lock and dam at Herr Island (No. 1).*—This structure was completed and was assigned to "Operating and Care of Canals, etc.," on January 1, 1903. Between

<sup>a</sup> By supplemental contract, dated November 29, 1901, approved by Secretary of War December 13, 1901, this contract was abrogated so far as it pertained to lock and dam at Six-Mile Island (No. 2).

<sup>b</sup> Emergency contract.

August 7 and November 15 Hingston & Pihl, contractors for the foundations, placed the large, rough protection stone along the face of the abutment below the dam, decked the apron cribs below the bear-trap weirs, finished the concrete work at the hinges of the bear-trap gates, and built their upper concrete sills, placed the steel rubbing bars and mortar facing in the recesses of the piers, paved both guide cribs at the lock, and performed all of the pumping of water leakage from the cofferdam inclosure, as required under their contract. At the same time Thomas Marshall erected in place the four gates in the bear-trap weirs, tested the two lower gates for watertightness, and passed all four through their entire range of motion. Upon the completion of the permanent works the contractors for the foundations removed the remaining portions of cofferdams, 560 feet long, as required, and dredged the river bed above the bear-trap weirs to the level of their respective sills, which work was finished on January 8, 1903.

The following is a statement of materials furnished and placed and work performed by the contractors:

Oak lumber .....	feet B. M.	79,443
Stone protection .....	cubic yards	90
Concrete .....	do	132
Stone paving .....	square yards	450
Excavation .....	cubic yards	2,991
Pumping, cofferdam .....	days	115
Wrought-iron bolts, etc .....	pounds	19,222
Wrought steel .....	do	426,965
Bronze .....	do	1,390
Springs, steel .....	do	3,278
Cast iron .....	do	7,590
Steel castings .....	do	78,967

After an ineffectual effort to secure bids for constructing a maneuvering boat for operating the Chanoine wickets of the navigable pass, materials were purchased and the hull constructed by the hired labor force. The machinery was manufactured by Thomas Carlins Sons Company, and subsequently installed on the boat by them. The hired labor force also placed the bumping planks on the lock gates; set the culvert intake shutters and screens, valve operating gearing, propeller pump and motor and air compressor plant, cover plates, etc., at the bear-trap piers and abutment; resurfaced the walls of the apron cribs below the bear-trap gates; set the valve and lock gate operating devices at the lock, the gates having been previously launched, conveyed to the lock, placed in position, and anchored by the repair force from the Monongahela River works; adjusted the lock gates and valves and removed gravel deposits from the lock chamber; equipped the maneuvering boat; razed the cement storehouse on the site of the lockmaster's house; excavated the cellar, constructed the sewer system, concrete foundation, and concrete cellar floor for the lockmaster's house, and performed inspection duties on parts of the work under contract.

The contract for erecting the superstructure of the lock house was let to S. H. McCain, of Allegheny, Pa., for \$6,806. The building is a brick veneered frame in two flats, having six rooms and a hallway on each floor. The contractor began his work on November 11, 1902, and completed it in March, 1903.

The lock being practically completed was put into active service for commerce on December 2, 1902, and so continued until turned over to "Operating and Care, etc.," on January 1, 1903.

*Lock and dam at Six-Mile Island (No. 2).*—The funds available for the prosecution of this work at the beginning of the fiscal year were sufficient only for the construction of the lock and the abutment for the dam. When therefore the approval of the title to the land acquired from the city of Pittsburg was announced by the Department of Justice, and the plans and specifications for those parts of the work were completed, bids were solicited and the work let to the Dravo Contracting Company, of Pittsburg, Pa., under a contract dated December 31, 1902. Later the drawings for lock irons, valves, and their operating gearings, iron hollow quoins, snubbing posts, anchorages, etc., were prepared and a contract for their manufacture made.

Early in April the contractor for the lock and abutment commenced the delivery of materials and plant for the work, and on April 25 the construction of a cofferdam for the lock was begun. The location of this lock is fairly in the running channel of the river, in very swift rapids, making the building of the cofferdam both difficult and expensive. Until the Herr Island dam was raised on June 2,

progress had been discouragingly slow, but thereafter the pool produced at the site of Lock No. 2 enabled the work to proceed satisfactorily. At the end of the year the cofferdam was practically finished and much of the excavation for the foundation of the lock and the lock floor made. The permanent work accomplished was 5,659 cubic yards of gravel and rock excavation. Several car loads of cement have also been delivered at the lock site, of which the prescribed tests were under way.

*Lock and dam at Springdale (No. 3).*—Numerous freshets scattered throughout the entire year made it an exceedingly unfavorable one for the completion of this structure, which from the first of the year on required low water. The lock underwent practically no changes during the year, every effort, when conditions proved favorable, having been concentrated in an endeavor to complete the abutment, and especially to construct the remainder of the dam below the low-water surface. At the abutment the main concrete core wall in prolongation of the crest of the dam was completed, the core wall at the lower end of the abutment crib nearly constructed, the necessary embankment between these walls made, and the concrete paving placed to about the elevation of the crest of the dam. All of the material that had deposited in the excavation made for the remainder of the dam during the previous year was removed, and the submerged cribwork, 589 feet long, placed in two sections. The first section, 200 feet long, 50 feet wide, and 16 feet deep, was sunk into position next adjoining the lock in August. About 60 per cent of the stone and gravel ballast was placed in it, the piles driven along the downstream face, a part of the horizontal apron decked, and the upstream face sheathed with two thicknesses of planks. The section closing the gap in the middle of the river, 389 by 50 by 16 feet, was settled into position during a temporary subsidence of the rises in the latter part of October and in November. Only about one-half of the required ballast had been deposited in this crib when winter set in, but the piles along the downstream face and sheathing on the upstream face were nearly all placed. The work yet to be done on this structure comprises building and setting the lock gates and part of their hollow quoins, setting two lock valves and the operating gearing for both lock gates and valves, paving the guide cribs, constructing the dam from 1 foot above low water to top, a height of 11 feet, placing remainder of filling in submerged cribwork of dam, depositing gravel backing above dam, and paving abutment from level of crest of dam to top of bank.

The materials furnished and placed and work done under this contract during the year were as follows:

Earth excavation and dredging .....	cubic yards..	9,337
Embankment .....	do.....	300
Gravel filling in dam and backing .....	do.....	5,639
Concrete, Portland cement .....	do.....	531
Stone, ballast and protection .....	do.....	2,286
White-oak lumber .....	feet B. M. .	102,176
Hemlock lumber .....	do.....	454,378
Oak piles .....	number..	237
Driftbolts .....	pounds..	38,522

## G G 8.

### OPERATING AND CARE OF HERR ISLAND DAM (NO. 1), ALLEGHENY RIVER.

This structure was assigned to "Operating and Care of Canals, etc.," on January 1, 1903. At that time the lock was in service and the dam down. Except when flooded, the lock continued in service throughout the remainder of the fiscal year. The sills of the lock being 2 feet lower in elevation than the sill of the navigable pass of the dam, heavily laden craft begin to pass through the lock when the depth of water on the pass sill falls below 7 feet. As the stage of water diminishes the volume of traffic through the lock increases until at the lower stages practically all of it is locked by the dam.

On April 26 and 27, when the water for the first time this season approached conditions favoring the establishing of Herr Island pool, the initial attempt was made to raise the entire dam. The wickets of the navigable pass, 500 feet wide, were raised first. No difficulty was experienced in this operation, all of the wickets being in good condition except one which had been injured by tugs and was taken out. On the 27th and 28th and again on the 30th efforts were made to raise the bear-trap gates by means of air pumped into the lower gates combined with a water head of from 3 to 4 feet, due to the raising of the pass, but they failed even to move them. No definite conclusion was formed as to the cause for the failure of the gates to rise, but two slight modifications suggested themselves as worthy of consideration—first, that the culvert intakes, which were in the faces of the piers, should be so changed or otherwise arranged as to direct the flow of water into them instead of permitting it to flow swiftly by, perhaps creating a siphonic effect and materially diminishing the effective head underneath the gates, and, second, that the valves for distributing the air into the various compartments of the lower gates should be changed from ordinary service valves to special valves of neat adjustment, giving prompt and absolutely perfect control of the air distribution. To accomplish these changes the pass was lowered on May 1. The desired alterations in the culvert openings of the central pier were effected by placing below them two temporary wooden spur deflecting shutters, 6 feet wide by 10 feet high, and in the intake of the outer pier by cutting a new opening in the opposite side of the pier above the wickets.

With these changes made, the new air valves in place, and the 40-inch propeller screw pump installed in the central pier, several experimental trials at raising the bear-trap gates, both in comparatively still water and with what head could be created at low water, such as then prevailed, by raising the wickets of the pass, were made. No effort was made to develop the greatest efficiency of the propeller pump, which, although doubtless capable of rendering a valuable service with perhaps slight modifications, having failed of its purpose at the initial trial, its use for the time being was abandoned. The effectiveness of the pneumatic lifting feature of the gates was readily demonstrated, the 12-foot gate rising about 8 feet, or 2 or more feet above the water level, and the 10-foot gate 4 feet, or 1 foot above the same in still water, and either gate close to the water surface with a small head discharging over it. However, in all of these experiments the gates failed to respond to the water head. In every other respect they maneuvered satisfactorily.

The final results of the several trials to raise the gates seemed to point conclusively to excessive water leakage somewhere about or between the gates as the source of the difficulty. Acting upon this assumption, the mechanical lifting devices were attached, the gates suspended as high above the water as practicable, and measures taken to close temporarily, by means of thin boards fastened to the under side of the upper gates, as much of the space between the upper and lower gates of each weir as possible. This work was completed on June 2. At that time the dam was down except a few wickets at the lock. The bear-trap gates were first raised as high as the air would lift them, the larger one standing at about 2 feet above the water level and the smaller one 10 inches above. The wickets were then raised and needles put on. Both bear-trap dams responded promptly



to the increasing head of water, the 12-foot one rising to the top under the influence of a 15-inch head and the 10-foot one of about a 30-inch head. The process of raising the entire dam required five and three-fourths hours.

The dam remained in position until the rise of June 23, when it was lowered, and because of continued high water was not again raised during the month. While the dam was up all traffic was passed through the lock without delay or difficulty, every part of the plant giving prompt and satisfactory service.

The first occasion for lowering the dam, on June 23, afforded an opportunity for further experiments with the bear-trap gates. When it became necessary to flush the pool the gates of the 12-foot weir were lowered; after the pool had been reduced about 2 feet, and with a head of only 4.5 feet, these gates were successfully raised by the application of the water head alone, no air or other extraneous assistance being required. Later when owing to the rise it became necessary to repeat the flushing process, the same weir was again lowered and with a head of 5.7 feet rose much more rapidly than before. Subsequently with both bear-trap weirs down the gates of the smaller one rose readily with the assistance acquired from five minutes' pumping of air into it by a small air pump. After the rise had subsided somewhat, and before a head had been created by raising the navigable pass, air was introduced into the lower gates of both weirs, under the influence of which alone the 12-foot bear-trap repeatedly rose to its full height, and the 10-foot one to above one-half its height. While it is probable that some minor improvements will be made to these bear-traps with a view to facilitating their maneuvering, yet in their present state the results of their first month's operation are sufficient to indicate their value for the prompt regulation of the pool, and in general their success has been fairly well established.

From the time the dam was raised and all traffic passed through the lock, so many lockages occurred at various hours of the night that it became necessary to immediately provide for these by putting on duty a night force of lock men.

#### ALLOTMENT OF FUNDS.

January 9, 1903..... \$9,610

#### *Classified statement of expenditures incurred in operating and care of Herr Island dam, Allegheny River, for six months of the fiscal year ending June 30, 1903.*

Item.	Amount.
Salaries and wages.....	\$3,632.04
Miscellaneous supplies and services.....	1,601.58
Total.....	5,233.62

# 1686 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

COMMERCE PASSING HERR ISLAND DAM, ALLEGHENY RIVER, DURING SIX MONTHS  
ENDING JUNE 30, 1903.

	Number.	Tons. <sup>a</sup>
Steamboats.....	2,421	
Coal boats, barges, flats, boat bottoms, etc.....	8,136	
Rafts.....	186	
Other craft.....	117	
Barges, flats, etc. (new).....	20	
Coal.....		79,400
Coal-boat bottoms (new).....		8,424
Farm products.....		850
General merchandise.....		160
Gravel.....		44,348
Lath.....		21
Lumber.....		9,082
Manure.....		200
Posts, check, pit, etc.....		15,406
Sand.....		131,553
Steel rails and other iron products.....		251
Stone.....		282
Timber.....		29,490

<sup>a</sup> 2,000 pounds.

The above report of traffic includes in the half year period covered, the months of January, February, and March, during which navigation on the Allegheny is necessarily very light, owing to the large quantities of heavy ice the river puts out at that time.

## G G 9.

### IMPROVEMENT OF ALLEGHENY RIVER, PENNSYLVANIA.

This work comprises open-channel improvement and its maintenance.

During the fiscal year ending June 30, 1903, the work was limited to the removal of obstructions and the repair of existing structures, as follows:

*Red Bank dike.*—The temporary repairs made to this dike during the previous year were sufficient to prevent its absolute destruction. However, for a length of about 500 feet nearly all the stone paving and filling below the crest timber wall had been scoured out during the previous winter, and many decayed timbers torn off. This portion of the above dike was repaired by hired labor.

The following is a statement of the material handled and work done:

Timber removed.....	feet B. M.	75,000
Stone filling and paving removed.....	cubic yards..	1,000
Iron bolts cut and removed.....	pounds..	10,000
Oak timber placed.....	feet B. M.	69,480
Iron bolts placed.....	pounds..	13,060
Stone replaced.....	cubic yards..	1,200
Stone, new, quarried and placed.....	do.....	500

*Nicholson's Island dam.*—Two hundred cubic yards of large rough stone were added to those placed below the crest timber wall during the previous year, and any of the latter that had been moved by freshets or ice were restored to their proper place.

*Hickory dam.*—Slight repairs were made to the paving.

*Removal of obstructions.*—On September 1 a force of 1 foreman, 10 laborers, and 2 teamsters with teams began clearing the channel of

obstructions between Warren and Tionesta, Pa., a reach of 37 miles. Frequent small rises interfered considerably with this work and made it necessary to cover the ground more rapidly than was desirable in order to secure the best results; however, the more prominent obstructions were taken out, and points where navigation was most difficult greatly benefited. At White Oak chute a new channel was excavated through a bar, from the right to the left side of the river. A smaller force of 3 men also removed some objectionable rock obstructions from the channel below Oil City, particularly at the mouth of Red Bank and Mahoning creeks. In all there were moved 536 cubic yards of bowlders, 350 cubic yards of gravel, and 6 snags.

*Money statement.*

July 1, 1902, balance unexpended .....	\$10,940.92
June 30, 1903, amount expended during fiscal year .....	8,184.59
July 1, 1903, balance unexpended .....	2,756.33
July 1, 1903, outstanding liabilities .....	13.73
July 1, 1903, balance available .....	2,742.60
Amount that can be profitably expended in fiscal year ending June 30, 1905, for maintenance of improvement, in addition to the balance unexpended July 1, 1903 .....	
Submitted in compliance with requirements of sundry civil act of June 4, 1897.	15,000.00

APPROPRIATIONS.

March 3, 1879 .....	\$10,000	July 13, 1892 .....	\$25,000
June 14, 1880 .....	20,000	August 18, 1894 .....	12,500
March 3, 1881 .....	25,000	June 3, 1896 .....	12,500
August 2, 1882 .....	15,000	March 3, 1899 .....	15,000
July 5, 1884 .....	35,000	August 17, 1900 (allotment) ..	5,000
August 5, 1886 .....	30,000	June 13, 1902 .....	10,000
August 11, 1888 .....	25,000		
September 19, 1890 .....	20,000	Total .....	260,000

COMMERCIAL STATISTICS, CALENDAR YEAR 1902.

Again the usual custom of gathering the commercial statistics of the Allegheny River by communicating with the individual shippers and receivers of freight by water has been followed, that being the only means available for securing even an approximate estimate of the water transportation of the valley. Generally reports of river trade are solicited only from those who conduct a regular navigation business, and little or no effort is made to determine the volume of commerce of the much larger number of small intermittent shippers. To obtain the data from which the statement is compiled, letters were sent to 141 parties, of whom 102, or only 73 per cent, replied, and many of these who were known to have made considerable shipments indifferently stated that they had transacted no river business in 1902. Also, the statements of some others were so erratic as to necessitate throwing them out altogether. In view of these conditions and the further fact that doubtless many important shippers are unknown to this office, it is probable that the commerce of the entire river as reported will not exceed 75 per cent of the total river transportation.

1688 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

The discrepancy of approximately 571,000 tons between the reports for 1901 and 1902 is almost wholly accounted for in the items of sand and gravel, and is evidently due to errors in the reports of some of the sand companies.

Articles.	Quantity.	Articles.	Quantity.
	<i>Tons, a</i>		<i>Tons, a</i>
Barges (new).....	8,340	Manure.....	3,630
Bark.....	864	Piles.....	2,448
Battens (boat).....	77	Pipe (sewer).....	500
Boats (house).....	180	Poles (brace).....	912
Bottoms, coal-boat (new).....	30,384	Posts:	
Brick.....	63	Check.....	1,519
Coal.....	491,013	Pit.....	12,398
Curbstone.....	4,253	Sand.....	618,542
Flats (new).....	1,184	Shingles.....	79
General freight.....	1,335	Stone.....	15,655
Gravel.....	477,804	Tanks (iron).....	191
Iron:		Ties (railroad).....	1,005
In pigs.....	1,150	Timber.....	127,678
Scrap.....	451		
Structural.....	590	Total.....	1,848,321
Lath.....	384		
Lumber.....	36,342	Passengers..... number..	60,000
Machinery.....	850		

<sup>a</sup> 2,000 pounds.

G G 10.

EXAMINATION OF POOL NO. 1, OHIO RIVER (DAVIS ISLAND POOL) PITTSBURG HARBOR, PENNSYLVANIA, WITH ESTIMATE OF COST OF INCREASED DEPTH AND ADDITIONAL HARBOR FACILITIES.

UNITED STATES ENGINEER OFFICE,  
*Pittsburg, Pa., August 10, 1903.*

GENERAL: The Board of Officers of the Corps of Engineers ordered to assemble at Pittsburg, Pa., by S. O. No. 23, July 26, 1902, Headquarters Corps of Engineers, U. S. Army, to consider and report upon the examination at and below Pool No. 1, Ohio River, made with a view of securing increased depth and additional harbor facilities for the city of Pittsburg, and to submit an estimate of the cost thereof, as provided for in the river and harbor act of June 13, 1902, has the honor to submit the following report.

It is customary to accumulate in the harbor of Pittsburg during periods of low water large quantities of bulky freight, such as coal, iron, and similar products, loaded in boats and barges drawing from about 6 to 8½ feet of water. At times as much as a million tons of freight is thus harbored in the vicinity of Pittsburg. The boats and barges are kept in the deep water above the Davis Island movable dam until a rise in the river makes it possible for them to go down the stream. As soon as this rise comes the Davis Island dam is lowered and the fleet of boats and barges passes down the river as rapidly as possible.

There are inclosed herewith certain photographs that show the congested condition frequently to be found in the Pittsburg Harbor. There is at times now not sufficient room to harbor the freight intended for southern and southwestern shipment and allow room for the reasonably safe passage of packets and other boats in the harbor.

In considering the subject, it should be borne in mind that the requirements for a harbor such as that of Pittsburg are materially

different from those of a tide-water harbor. Boats suited for navigating a river such as the Ohio do not anchor but are tied to the shore, and generally a sloping bank is necessary for them to tie to in order that they may, as the river rises and falls, be readily moved to or from the bank. Several conditions limit largely the portions of actual water surface that can be used for harbor purposes, viz: It is impracticable to maintain throughout the entire section a uniform depth; the regimen of the stream shows deep water on the bend sides and shallow water on the points, and if this condition is changed the natural action of the river will be to reproduce it; manufacturing plants and especially railroads along the banks of the river have rendered useless for general harborage purposes a large portion of the harbor; experience at Davis Island Dam has shown it to be largely impracticable to operate movable dams in the upper part of the Ohio River during the winter months, so that, generally speaking, from December until May Davis Island Dam must be down and boats must be harbored at places where the water will be of sufficient depth without the aid of the dam. The question of converting Davis Island Dam into a combined dam, part of the height movable and part fixed, so as to assure a sufficient depth of water in and about Pittsburg at all seasons of the year, was considered, and while many advantages to, and in some instances necessities of, navigation would be produced by this change, the question can not be decided until a means of harboring all the freight for the southern markets below this pool is decided upon and accomplished. If the navigable depth of the Ohio River is to be made only 6 feet, a great portion of the freight intended for the southern markets will only be shipped as it is now, viz, during high stages of the river, when a draft of  $8\frac{1}{2}$  to 9 feet can be utilized, and the freight for such shipments must be harbored in Pool No. 1, Ohio River, and must be able to get out and go with the rise without the delay in locking, which would be forced if Davis Island Dam was converted for a considerable portion of its height into a fixed dam. This phase of the question is therefore left for future consideration and determination after experience has been had with a harbor of suitable depth below this dam.

The inclosed map of Pittsburg Harbor, which extends from Davis Island Dam, Ohio River, to McKeesport, Monongahela River, and to Brilliant, Allegheny River, shows that the space available for the Ohio River connection is from Smithfield Street Bridge, Monongahela River, to Davis Island Dam, Ohio River. In this space only can Ohio River boats now come and assemble their tows for passage down the Ohio. Barges and coal boats can, however, be harbored in the space from Smithfield street to Lock No. 1, Monongahela River, utilizing the smaller Monongahela River towboats to transfer them into the Ohio River connection when occasion requires.

The pools in the Monongahela River above Lock No. 1 are lined with manufacturing plants, and the active commerce on this portion of the river is so large that an extensive use of these pools for harborage purposes can not be had without interfering with such commerce. Further, the locks on the Monongahela River have fixed dams, which necessitates locking such boats as may be harbored there into the Ohio River connection before they can reach the Ohio River boats. During high stages of water this is often impracticable and even when practicable is a slow process. Barges and boats harbored in these pools would therefore often miss a suitable stage in the Ohio River for their transportation south. For these reasons there should be pro-

vided in the Pittsburg Harbor district sufficient harborage for all of the barges and towboats intended for southern and southwestern shipments, in pools with movable dams, and in which the Ohio River boats or suitable pool towboats can move freely in all practicable stages of water. In addition, the harbor in all of its extent should provide means for the free movement and harborage of packets suitable to the Allegheny and Monongahela rivers.

On the Allegheny River a most beneficial and important improvement to the harbor, although very limited in extent, has been provided for by the order of the Secretary of War of January 20, 1903, directing that the Union Bridge crossing this part of the harbor should be raised and so changed as to give suitable spans and a least clear height of 70 feet above pool No. 1, Ohio River, thus assuring the addition to the Ohio River connection of that portion of the Allegheny River lying between the Union Bridge and the Sixth Street Bridge. Above the Sixth Street Bridge, however, the Allegheny River bridges are too low to admit of the same use of that part of the harbor that is now made of the corresponding part of the Monongahela, namely, between the Smithfield Street Bridge and Lock No. 1, these bridges being approximately from 15 to 18 feet lower than those referred to on the Monongahela. The value of making available all of the pool formed by Dam No. 1, Ohio River, that lies below Dam No. 1 on the Allegheny River is greatly enhanced by the fact that the latter dam is movable.

The Board having carefully studied the present harbor conditions in the Pittsburg district is of the opinion that additional harbor facilities are urgently needed, and that they can be most expediently obtained by making the Allegheny River portion of Ohio River pool No. 1 as freely available as the Monongahela portion of that pool, and by providing increased depth in the Ohio River below said pool.

#### INCREASED HARBOR FACILITIES IN ALLEGHENY RIVER.

The United States has, by improvements already accomplished, created a sufficient navigable depth in that portion of the harbor lying in the Allegheny River. The use, however, of this portion is materially interfered with by low and obstructive bridges.

Of the bridges on the Allegheny River but two claim to have any authority of Congress for their existence, and this claim can only be valid on the assumption that all of the navigable part of this stream lies within the State of Pennsylvania. Reference to laws enacted by Congress will show that that body, from 1835 to date, has considered that portion of the Allegheny River lying within the State of New York as navigable, because it has three times authorized and appropriated money for surveying it and devising plans for its improvement. The records of the United States Engineer office at Pittsburg show that there is actually transported on the Allegheny River within the State of New York, and between the States of New York and Pennsylvania, a material amount of commerce, principally timber. In 1901 it exceeded 40,000 tons. In 1903 it was 52,180 tons.

If the laws of Congress and the conditions existing in fact show this stream of itself to be interstate, none of the bridges on the Allegheny River has any authority of Congress for its existence. If the decision be that all of the navigable part of the Allegheny River lies within the State of Pennsylvania, the permits for the two bridges that have authority for their existence under the above assumption contain provisions that reserve to the United States the right to increase the clear headroom; in one instance when the Secretary of War thinks

the same necessary or desirable and in the other when the work of raising the bridges below it is commenced.

All of the remaining bridges in the Allegheny River in Pittsburg harbor were built under franchises granted by the State of Pennsylvania. It is the opinion of the Board that section 18 of the river and harbor act of March 3, 1899, is sufficient for making this most essential part of the harbor available for the use of the people, since it is not thought that the exercise by a State of a power conferred solely upon Congress by the Constitution can create a vested right and thereby make the United States liable for damages should Congress act fully and freely in the manner specified in the Constitution. It is assumed that there is a well-defined distinction between a franchise and the method of placing it in execution where a crossing of the navigable waters of the United States is involved.

The Board has had prepared plans and estimates for such of these bridges the alteration of which might be a difficult problem, considering the local conditions, and reaches the conclusion that a satisfactory solution of the question is feasible and practicable without undue cost to the owners of the bridges and without materially interfering with the street grades of the cities of Pittsburg and Allegheny or communication between such cities.

The Board is of the opinion that a clearance approximately of 50 feet above Davis Island pool, under a span of suitable width, is essential in the case of the bridges crossing the Allegheny River within that portion of the Pittsburg Harbor under consideration. This height is the same as that expressly provided for in the permit granted the Pittsburg, Fort Wayne and Chicago Railway Company by the War Department, and is approximately the same as that required in all of the recent permits granted by the War Department for bridges across the slack-watered portions of the Allegheny and Monongahela rivers.

In view of the foregoing the Board is of the opinion that the first important step in securing for Pittsburg adequate harbor facilities is the removal of the obstructive features to navigation presented by the bridges across that portion of the harbor in the Allegheny River. Further, in its opinion, the cost of effecting suitable changes in the bridges in question is not properly chargeable to the United States. In this connection there is appended hereto a copy of a report of a Board of Engineer officers of blank date, which treats essentially the questions involved in making that portion of Pittsburg Harbor lying in the Allegheny River available for an unobstructed use.

#### INCREASED HARBOR FACILITIES BELOW POOL NO. 1, OHIO RIVER.

The least depth maintained at present at pool stage from Davis Island Dam up in the lower Pittsburg Harbor, or that used for the Ohio River connection, is 10 feet.

The greater the draft the cheaper the transportation by water. This is especially true when the length of haulage is great. Assuming a boat to be of a certain draft, say, 5, 6, 7, or 9 feet, there is some length of haul where transportation for that draft would cease to pay at prices that would enable this system to compete with other systems. Navigation on the Ohio River is intermittent and the distance to tide water via that stream and the Mississippi is great, consequently it is essential that boats in this transportation trade have as much draft as practicable, and the present boats actually engaged in the above transportation have a draft of from 8 to 8½ feet.

The present plan for improving the Ohio River contemplates a navigable depth of 6 feet at pool stage, which depth is insufficient by 2½ feet for the system of boats now in use on the river in the transportation of freight to New Orleans. The pools below Dam No. 1 on the Ohio River will therefore be useless for harbor purposes for the craft now in use, and if increased harborage in the vicinity of Pittsburg is sought down the Ohio River it can only be obtained in two ways: Boats must either be so changed as to draw only 6 feet or the system of locks and dams be so changed as to accommodate at least the present boats. Boats drawing 8½ feet of water should have at least 9 feet in the channel.

After consulting the larger shippers of coal from Pittsburg to New Orleans the conclusion is reached that towing by the wholesale from Pittsburg to New Orleans can be done at a profit on 6-foot draft at a cost of 75 cents per ton of freight towed and at a cost of 54 cents per ton on a 9-foot draft. This, however, would not form a proper basis for comparing this system of transportation with any other. It does not include the cost of the return of barges to Pittsburg or the cost of the cheaply constructed coal boat that is often not returned. Charging to transportation the cost of the coal boat and assuming that it goes with the cargo, the cost of transporting coal to New Orleans on a 6-foot draft is \$1.67½ per ton, and on a 9-foot draft \$1.35½. The net saving, therefore, to the transporter of coal on a 9-foot draft instead of on a 6-foot draft is, under any circumstances, 32½ cents per ton on freight from Pittsburg to New Orleans.

It is confidently believed by the Board that the saving on higher grades of freight shipped in boats that will be returned will be at least as much and probably more than that stated above. There were shipped from Pittsburg south during the last fiscal year via the Ohio River 4,616,227 tons. With a depth of 9 feet in the Ohio and Mississippi rivers, and with the Isthmian Canal completed, it is thought to be safe to assume that the above saving will be effected on at least 10,000,000 tons of freight a year. A saving of 32½ cents per ton in the transportation of the above amount of freight would be \$3,250,000 per annum, which if capitalized at 3 per cent would be \$108,333,333.33.

The Ohio River from Davis Island dam to Lock No. 6 is destined to be lined on both banks with extensive manufacturing establishments. In fact, many such establishments are now constructed, or are being constructed, or the land that is necessary for them has been purchased by persons or corporations intending to erect such structures thereon as soon as slack water is an accomplished fact. Practically all of these establishments will manufacture in some form iron or steel or other products likely to seek a tide water outlet, and products that will require the greatest practicable depth for their economical shipment by water. This portion of the Ohio River has a steep slope, and safe harborage within it will consequently be limited in extent. Below Pittsburg the first natural harbor of much extent, with favorable conditions, will be in the pool formed by the seventh dam. Boats harbored in this pool will often be enabled to proceed to market in an open river when they could not so proceed from Pittsburg. The slope of the river below is less and the addition of the flow of Beaver River to that of the Ohio makes at many times a material difference in the navigable stage below. Moreover, pool No. 7 is the first one below Davis Island dam in which there is any considerable area of water deep enough for winter storage when the dams are down.

The Board is therefore of the opinion that in order to properly extend the Pittsburg Harbor down the Ohio River and to meet the evident



demands that will be made by the manufacturing plants on the Ohio River within the Pittsburg district, that a depth of 9 feet should be provided from Davis Island to Lock No. 7. This can be accomplished by increasing the height of the dams, by lowering the sills and dredging, or partly by one method and partly by the other.

The experience at Davis Island dam shows the practicability of maintaining a head of 11 feet on a movable dam, such head having been maintained each year for the last seventeen or eighteen years. There is no question, then, as to the flow of the Ohio River being sufficient to maintain pools giving a 9-foot depth, and the question as to whether this increased depth shall be provided by lowering the sills and dredging or by raising the dams will be determined on one side by cost and on the other by the length of wicket that it is practicable to operate. No trouble has been experienced in operating the wickets at Davis Island dam, which have a total vertical height of 12.1 feet, and the ease of such operation leads the Board to believe that it will be thoroughly practicable, with suitable appliances, to operate a wicket in the navigable pass of a total vertical height of about 15 feet.

A study of the conditions existing at Dams 1 to 7 shows the following as a practicable way to accomplish the results desired:

Dam No. 7 is not yet designed, and therefore it can be so designed, as to give the requisite depth on the lower miter sill at No. 6. No changes, therefore, will be necessary at No. 6.

At Dam No. 5 the movable parts are not yet under contract, and such parts could be made so as to give 3 feet additional depth to the contemplated pool by making the vertical height from sill of navigable pass to pool surface 14.5 feet. It would also be necessary at this lock, since no changes are contemplated at No. 6, to lower the sill 3 feet.

The vertical distance from sill to present pool surface of Dam No. 4 being 13.6 feet, and since it would be impracticable to add 3 feet to the height of this dam, nothing is proposed at No. 4.

At Lock No. 3 it will therefore be necessary to lower the sill 3 feet. The movable parts for this dam not being under contract, 1 foot could be added to the height of this dam without too great length of wicket and add very little additional cost.

At Lock No. 2 it will therefore be necessary to lower the sill 2 feet. The navigable pass of Dam No. 2 is already constructed, but it is thought that the wickets themselves can be increased  $1\frac{1}{2}$  feet in length and still leave the center of pressure sufficiently low to insure the stability of the dam, and such change is proposed.

At Lock No. 1, therefore, it will be necessary to lower the sill  $1\frac{1}{2}$  feet in order to make 9-foot navigation practicable, in so far as the sills are concerned.

Dredging will of course be necessary in the second, third, fourth, fifth, and sixth pools, and possibly in the seventh.

The following is an estimate for the accomplishment of the change from 6 feet to 9 feet depth, in accordance with the plan outlined above, the cost of the dredging being included at the various places:

Dam No. 1.....	\$46,400
Dam No. 2.....	73,000
Dam No. 3.....	76,000
Dam No. 5.....	132,600
Dam No. 7.....	54,000
Total.....	382,000

The Board does not wish to recommend definitely the amount that a particular dam shall be raised or sill lowered, believing that the exact determination of these elements had better be left for further study, but it is of the opinion that the estimate given will cover the cost of effecting the desired result.

In the opinion of the Board the harbor is worthy of improvement by the General Government. The facts and reasons upon which this opinion is based are set forth in the report of the Board. No survey is necessary.

Respectfully submitted.

G. J. LYDECKER,  
*Colonel, Corps of Engineers.*

WM. L. SIBERT,  
*Captain, Corps of Engineers.*

W. E. CRAIGHILL,  
*Captain, Corps of Engineers.*

Brig. Gen. G. L. GILLESPIE,  
*Chief of Engineers, U. S. A.*

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REPORT OF BOARD ON BRIDGE OF PITTSBURG, FORT WAYNE AND CHICAGO RAILWAY ACROSS ALLEGHENY RIVER.

GENERAL: The Board of officers of the Corps of Engineers ordered to assemble by Special Orders, No. 10, current series, from the Headquarters of the Corps of Engineers, to consider and report upon the plans of the proposed addition to the bridge of the Pittsburg, Fort Wayne and Chicago Railway across the Allegheny River from Pittsburg to Allegheny, Pa., has the honor to submit the following report:

To enable it to reach its conclusions the Board has held a public session in Pittsburg, of which due notice and invitation to be present was given to the parties in interest; has deliberated upon the arguments and information laid before it, both orally and in writing; has visited the locality and has examined the bridge in question, as well as other bridges across the Allegheny River at Pittsburg, making its inspection both by land and by water.

The Allegheny River is an important waterway, the improvement of which has been undertaken by the United States Government. Large sums of money have been appropriated for open-river regulation, and the construction of three locks and dams (pooling the lower 24 miles), has been authorized under continuing contracts. In addition Congress has ordered a survey to determine what remaining portion of the river can be made navigable with an estimate of the cost of the work, and in the resulting report the extension of the slack-water system for a farther distance of 56 miles was recommended as worthy to be undertaken. The total sums already appropriated or authorized under future contracts for improving the river aggregate in round numbers \$1,377,000, exclusive of the proper share of the funds appropriated separately for the harbor at Pittsburg, while the recommended extension of the slack-water system will involve a further expenditure estimated at about \$2,500,000.

The present importance of the river as an aid to commerce is greatest at its lower portion, which forms part of the harbor of Pittsburg. In 1898 the Allegheny River part of the harbor had a traffic of about 2,307,000 tons, while the commerce passing a point on the river about 7 miles farther up was about 294,000 tons. (Annual Report Chief of Engineers for 1899, p. 2409.) From the reports already received by the United States engineer office at Pittsburg, it is estimated that the commercial movement in the Allegheny River part of Pittsburg and Allegheny harbors during the calendar year 1899, amounted to about 3,000,000 tons. Much of this movement is the delivery to factories of coal and other material which can be handled most economically by water, and of which a regular and reliable supply is necessary.

To insure such delivery, as well as to facilitate the ordinary traffic, it is eminently desirable that the harbor should be available at all times for powerful steamers, capable of handling large tows, while both in the harbor and on the

river above, the passage of packets should be unimpeded at stages of water when the current and condition of the landings permit navigation. At present this is far from being the case. The Allegheny River is obstructed throughout its course by low bridges, of which several lie within the harbor of Pittsburgh. The headroom of these ranges from 30 to 35 feet above pool level, and the widths between piers from 152 to 445 feet. (See inclosures 29 and 34, and Annual Report Chief of Engineers for 1898, p. 2205.) The Union, Sixth street, Seventh street, Ninth street, Pittsburgh, Fort Wayne and Chicago Railway, and Sixteenth street bridges span the pool formed by Davis Island Dam on the Ohio River below Pittsburgh. The Thirtieth street, Thirty-third street, Forty-third street, Sharpsburg, and Highland Park bridges, the last named not yet constructed, span the pool of the Herrs Island Dam, the first of the Allegheny River series, which will shortly be completed. While the lack of headroom of the lowest three of the Herrs Island pool bridges is not at present so serious an obstruction as that of the bridges across the Davis Island pool, yet it will become equally obstructive when the Herrs Island Dam is up. Of the two bridges farthest upstream, the one at Sharpsburg has recently been reconstructed with a good headroom of 52.4 feet above the Herrs Island pool level, and the Highland Park highway bridge, which has not yet been built, is to have a headroom of 55 feet above the same datum.

All of these bridges except three have been reported to the Chief of Engineers as unnecessarily obstructive by the engineer officer in charge of the Allegheny River improvement. They are old bridges, and when originally built were not regulated in headroom or width of channel span by any action of the General Government. In recent years it has been the practice of the General Government in granting charters to bridge the Allegheny River to require a headroom of at least 50 feet above pool level and a channel span of from 400 to 500 feet; or to insert in the bridge charter a clause requiring further alterations to be made in the interests of navigation as the Secretary of War may require.

The character of the bridges on the lower Allegheny has forced the boats plying on this river to limit their height as much as possible. The highest fixed points of the tugboats and packets entering the harbor of Pittsburgh range to 56 feet above the water line, while the height of those entering the Allegheny River is restricted by the bridges to a maximum of about 30 feet. (See inclosure 1.<sup>a</sup>) The ordinary Allegheny River towboats measure 22 to 26 feet in height, and even these can not use the lower river at certain stages, which would be favorable for business were the bridges less obstructive. Ordinary high water is 18 feet, and extreme flood about 30 feet above pool level; while rises of from 4 to 8 feet above pool level cut off the towboats one after another, according to their size, until at a stage of 10 feet above pool level, which is equivalent to 16 feet on the Market street gauge, no business can be done. The pilots say that a 12-foot stage on the gauge, or 6 feet above pool, practically limits their work. Since January, 1880, the water has been at this or a higher stage on 539 days, or an average of 25 days per year. (See inclosure 17.<sup>a</sup>)

The boats using the river, unless of a very small size, are obliged to lower their stacks in passing under the bridges, on account of the number of the latter. This necessity results in the stacks being down all the time while running in Allegheny Harbor. The evident effect of the low bridges is at all times to limit narrowly the size and power of the boats, and frequently to reduce still further their effectiveness by requiring the stacks to be lowered, with consequent loss of draft, and annoyance due to the volume of smoke issuing at the level of the pilot house, and at times entirely to stop navigation.

In addition to the low headroom of the bridges, navigators also criticize severely the narrowness of the channel spans and the position of the piers in the river. The spans varying in width and distance from shore, as they do, the channel under one bridge is usually not fair with the channel under the next one, which may be very close to it, while the narrow channel span of some of the bridges, perhaps still further contracted by riprap around the pier foundations, are difficult to run in a swift or even moderate current.

Among these obstructive bridges is that of the Pittsburgh, Fort Wayne and Chicago Railway Company, crossing the river near Eleventh street. The bridge is a double track, through, lattice-girder structure, 870 feet long between piers, with five piers in the river. The piers are oblique to the current and are about 50 feet long at the top, measured perpendicularly to the line of the roadway. The channel space, supposed to be 150 feet wide between piers, is reduced to about 117 feet in width by riprap placed about the foundations. The clear headroom of the bridge is 35 feet above pool level. The structure was built many years ago, and has, so far as is known, no authorization from the United States Government.

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<sup>a</sup> Not printed.

Navigators regard this bridge as the most dangerous one on the lower river by reason of the obliquity of the piers and the narrowness of the channel span. It is stated to have caused ten or more wrecks in the past seventeen years, and the affidavits and statements laid before the Board indicate that it is responsible for many. The headroom is insufficient, but is 1 or 2 feet greater than that of the ones next above and below.

The railway company desires now to change the bridge, particularly in order to do away with grade crossings in the cities, and in the changes has two objects to keep in view—(a) to preserve access to its freight yards in Pittsburg and its connection with the Allegheny Valley Railroad, both of which are at a low grade suited to the level of the present bridge, and (b) at the same time to carry its main line at an elevation suited to the required overhead street crossings. To effect its objects the company proposes to extend the present piers upstream to a length of 85 feet, preserving the present obliquity to the current; to retain the present superstructure and to build alongside of it on the extended piers a second, double-floored, superstructure, with the lower floor on the line of the present bridge and the upper floor 21 feet above it. The main-line traffic would pass on the upper floor, the freight for the yard and the business connecting with the Allegheny Valley Railroad would be served by the lower tracks. The two levels would be connected by a slope of 1.347 per cent, the tracks of the approaches being all at a high level to avoid street crossings at grade. The line of the upper floor, as shown on the blueprint submitted by the company with its application, appears to be 3 feet higher than that required to effect the overhead crossing, and this excess of height is apparently due to the necessity of gaining headroom over the lower floor of the bridge. The rise of 3 feet is accomplished by a grade just before reaching the bridge. The freight yard being close to the Pittsburg end of the bridge a grade connecting it directly with the high-level tracks of the proposed bridge would be necessarily a steep one, and similarly a long causeway would be needed to get down from the high-level tracks to the Allegheny Valley Railroad on a grade suitable for traffic; but it should be noted that a bridge giving 50 feet headroom at pool level need be only 15 feet higher than the present bridge, which, with the same depth of floor system, would bring the roadway at reference (755.3), whereas the high-grade tracks of the proposed bridge are at reference (760).

The arguments for permitting the change, as proposed, are set forth in General Manager Loree's written and oral statements to the Board. (Inclosures 19 and 30).<sup>a</sup> They are, briefly, that the bridge was originally constructed with its present piers and grade; that the grade of the tracks in the freight yard near the Pittsburg end of the bridge and of the connection with the Allegheny Valley Railroad preclude any great elevation of the roadway of the bridge communicating with these tracks; that the public desire to do away with grade crossings in the cities of Allegheny and Pittsburg renders elevation of the main-line tracks desirable; that the other low bridges over the Allegheny River and the long existing conditions make it impossible to establish a new clearance in excess of 35 feet above pool level because of the effect on property on both sides of the river; that the interruption to commerce caused by the alleged present lack of clearance are so slight as to work no great hardship; that there is nothing unfair in requiring the commerce under the bridge, which he states at, say 200,000 tons, to suffer a slight inconvenience to give freedom of movement to the commerce over the bridge, which he states at over 6,000,000 tons, and to avoid the destruction for terminal purposes of \$2,000,000 of property convenient of access, and for which a substitute can not be obtained at any price; that the same arguments prove that no necessity exists for increasing the span of the bridge as recommended by Major Powell in his report on the company's application, which would cost the company not less than \$1,000,000; and that to compel these changes is forcing an unnecessary hardship upon the railway company without corresponding compensating advantages to any other interest.

The arguments of the interests opposing the proposed change are set forth in the communications<sup>a</sup> inclosed and the report of public hearing held by the Board. They are, in brief, that the bridge is now more dangerous than any other by reason of the low headroom, the short span, and the obliquity of the piers, which still further reduces the narrow channel way by throwing a large part of it into eddy; that a further lengthening of the piers will intensify the trouble by increasing the eddy and decreasing the already narrow channel available in the direction of the current; that the commerce on the Allegheny Harbor is much larger than that stated by Mr. Loree and has a right to a reasonably free and unobstructed use of the waterway; that it is feasible to increase the headroom and channel way of the bridge, the question involved being merely that of expense; that it is right

<sup>a</sup> Not printed.

that the railroad should bear this expense rather than that the river commerce should be further hampered for its convenience; that there is ground to believe that the other existing low bridges may be forced to take a higher grade sometime in the future, and that to authorize the bad features of the present bridge to be perpetuated in an aggravated form in a new and costly railway bridge would have the effect of fixing permanently upon the Allegheny River commerce serious restrictions from which it is now struggling to free itself.

The dimensions asked by the navigators for the reconstructed bridge are a clear headroom of 54 feet and a channel span of 500 feet.

The visits made to the locality, as well as the testimony offered, have convinced the Board that the contentions of the navigators are in the main correct. All the bridges over the Allegheny River, within the Pittsburgh limits, from the Ohio River to and including the Forty-third Street Bridge, are obstructive, but the Pittsburgh, Fort Wayne and Chicago Railroad Bridge is the most serious obstruction of them all. The headroom is insufficient, though no worse than that of others, and, indeed, better than most by 2 or 3 feet, while the narrowness of the channel span and the obliquity of the piers combine to make it decidedly the most difficult one to pass. The number of wrecks which it has caused shows the dangerous nature of the obstruction. The Board considers the further lengthening of the piers, as proposed, to be inadmissible. The obliquity of the extended piers would reduce the available space parallel to the current to 105 feet if riprap be used as a protection, as has been done with the present piers, and of this narrow opening the greater part would be in eddy. The result would unquestionably be to increase greatly the difficulty already experienced in passing the bridge. The Board is of the opinion that the traffic on the lower Allegheny River is of sufficient importance to require a clear headroom of at least 50 feet above pool level and a channel way of at least 400 feet in the clear. The headroom named will be sufficient to allow all but the largest boats entering Pittsburgh Harbor to navigate the Lower Allegheny at pool or low-water stage, and boats of fair power and size at the higher stages, and the channel way is considered sufficient to insure a fairly unobstructed passage for large tows.

As has been stated, a single-floor bridge can be built which will give 50 feet headroom over the channel at pool stage and will be 4 or 5 feet lower than the upper floor of the proposed bridge. It would thus be about 15 feet above the grade of the present lower track instead of 21 feet, the height proposed for the upper deck of the new bridge, and this difference in grade down to the freight yard would be overcome by a curved approach on a suitable slope, or by raising the grade of part of the freight yard, or partly by each. The connection with the Allegheny Valley road could also be made by a graded approach, if necessary, while any level needed for the street crossings could be reached by a gentle rise from the bridge, or by laying the main track on the bridge at a suitable grade. The Board considers, therefore, that it is practicable for the railroad company to raise the new bridge to a level convenient for navigation and to widen the channel space. Both of these improvements will undoubtedly add to the expense of the work. It becomes, therefore, a question whether the commerce of the Allegheny harbor, which is shown by the records of the local engineer office to be twelve to fifteen times as great as Mr. Loree's estimate of the traffic under the bridge, should be compelled to suffer in order to lessen the cost to the railroad company. The Board is of the opinion that the river commerce should not be thus hampered and restricted.

It is believed that from time to time, as necessity for repair shall arise, even if it be judged best not to take legal proceedings against them before such a time shall come, all existing bridges over the Allegheny River should be required to conform to the necessities of navigation. For this reason the Board considers that it would be unwise to permit the reconstruction, without great improvement, of the railroad bridge in question; since such a reconstruction would help to perpetuate the existing conditions which go far toward nullifying the effect of the large expenditures by the Government for the improvement of the lower Allegheny, an improvement which may be reasonably expected to increase largely the commerce of the river.

The Board therefore recommends that the plans presented for the reconstruction of the Pittsburgh, Fort Wayne and Chicago Railway Company's bridge over the Allegheny River at Pittsburgh be disapproved, and that the company be required to submit new plans embodying the following features:

1. The lowest point of the superstructure or anything attached thereto shall be at least 50 feet above the normal level of Davis Island pool, except as noted in paragraph 4.

2. That the bridge shall have a channel span with a clear width of at least 400 feet between the piers, measured at normal level of Davis Island pool, the other spans to be not less than 150 feet between centers of piers.

3. That no riprap or other protection to the foundations of the channel piers which diminishes the waterway shall be used and all piers shall be parallel to the current.

4. That the channel span shall be located next the Pittsburg bank or, if so desired, that the shore pier of the channel span may occupy a position in the stream not more than 110 feet in the clear from the harbor line, as does the existing first pier from the Pittsburg shore, in which case the waterway between the first pier and the shore should be left open and uncontracted, and the superstructure between the pier and shore may be 2 feet lower than that of other spans.

5. That those piers of the existing bridge which are not used in the new bridge and which stand in the river shall be removed to a depth at least 8 feet below the normal level of Davis Island pool.

The Board desires to express its acknowledgment of the statistics and much other information collected and placed at its disposal by Maj. C. F. Powell, Corps of Engineers, in charge of the improvement of the Allegheny River.

Respectfully submitted.

AMOS STICKNEY,  
*Lieutenant-Colonel of Engineers.*

THOS. H. HANDBURY,  
*Major, Corps of Engineers.*

H. F. HODGES.  
*Captain, Corps of Engineers.*

Brig. Gen. JOHN M. WILSON,  
*Chief of Engineers, U. S. Army.*

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G G 11.

ESTABLISHMENT OF HARBOR LINES ON LEFT BANK OF THE MONONGAHELA RIVER FROM WILSON TO ELIZABETH, PENNSYLVANIA.

ST. CLAIR STEEL COMPANY,  
*Pittsburg, Pa., June 23, 1902.*

DEAR SIR: We herewith inclose the petition<sup>a</sup> of certain property holders on the right bank of the Monongahela River for the establishment of a harbor line between Wilsons station and West Elizabeth station on the Pittsburg, Virginia and Charleston Railroad. By United States Express, per receipt<sup>a</sup> herewith, we forward you maps,<sup>a</sup> in three sections, of the Monongahela River between the points named, showing a proposed harbor line, the establishment of which is asked in the inclosed petition.

We trust you will give the matter prompt attention, as the blast furnaces and steel works of our company and that of the St. Clair Furnace Company are approaching completion, which makes it important that the harbor line be established as soon as possible.

Awaiting your acknowledgment of the receipt of this petition and the accompanying maps, which are furnished in triplicate, we remain,

Yours, very truly,

ST. CLAIR STEEL CO.,  
JNO. A. SUTTON,  
*Secretary.*

To the honorable SECRETARY OF WAR,  
*Washington, D. C.*

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<sup>a</sup> Not printed.

[Second indorsement.]

OFFICE CHIEF OF ENGINEERS,  
U. S. ARMY,  
*June 28, 1902.*

Respectfully referred to Capt. W. L. Sibert, Corps of Engineers,  
for report.

To be returned.

By command of Brigadier General Gillespie:

A. MACKENZIE,  
*Colonel, Corps of Engineers.*

[Third indorsement.]

UNITED STATES ENGINEER OFFICE,  
*Pittsburg, Pa., July 2, 1902.*

Respectfully returned to the Chief of Engineers, U. S. Army.

1. The reach of river on which an establishment of harbor lines is requested is 20 miles above the mouth. The lower limit of this reach is 4.27 miles above the upper limit of the present harbor lines.

2. This application is for the establishment of harbor lines on one side of the river only. Manufacturing plants are now being built on the bottom lands along this portion of the river, and it will be of much benefit to the owners of such plants to have a harbor line or building line established along the river front. Such establishment and the marking of such lines on the banks would be of benefit to the United States in preserving and protecting the harbor, in that its agents could easily tell when and by whom the laws affecting navigable streams are violated.

3. So far as this office can tell the maps submitted with this application are, for all practical purposes, correct. However, should the establishment of harbor lines on this reach of river be undertaken, the petitioners should furnish the United States with the tracings from which these maps were printed and with the location of sufficient stations to make it practicable to check the maps furnished and establish harbor lines on the ground.

4. It is the opinion of this office that harbor lines should never be established on one side of the river only, but should be established on both sides at the same time. The petitioners have shown on maps herewith a suggested harbor line. This harbor line follows practically the low-water line of the river. They evidently misapprehended the meaning of a harbor line and intended their suggested line to be the foot of the harbor-line slope; otherwise the river would be contracted at least 42 feet for the entire length of this reach by such establishment. From the present rate of development in this portion of the Monongahela River, the indications are that a request for the establishment of harbor lines between the upper limit of the present harbor lines and the reach of river shown on maps herewith will soon be made, and that it will be necessary to establish harbor lines at least to the upper limit of the reach in consideration now.

5. It is thought that should the maps submitted by the applicants prove sufficiently accurate for the purposes in question that the present appropriation for improvement of Pittsburg Harbor, maintenance, will be sufficient to mark and maintain such marks in the additional reach of river covered by this application.

6. It is the opinion of this office that it would be to the best interests of the river and of the applicants to establish harbor lines, such lines

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to be established absolutely independently of the proposed lines in this application, and following, generally speaking, the principles that have been followed in the previous establishment of such lines.

WM. L. SIBERT,  
*Captain, Corps of Engineers.*

[Fourth indorsement.]

OFFICE CHIEF OF ENGINEERS, U. S. ARMY,  
*July 10, 1902.*

Respectfully returned to Captain Sibert, whose opinion, expressed in paragraph 6 of third indorsement hereon, is concurred in.

Captain Sibert will take the necessary steps for the establishment of the lines, having in view the provisions of section 11 of the act of March 3, 1899.

It is suggested that he request the applicants to furnish the original tracings from which the maps were printed and such further information as may be desirable.

To be returned.

A. MACKENZIE,  
*Acting Chief of Engineers.*

[Fifth indorsement.]

U. S. ENGINEER OFFICE,  
*Pittsburg, Pa., November 7, 1902.*

Respectfully returned to the Chief of Engineers, United States Army.

The applicants for the establishment of harbor lines on the Monongahela River from Wilson, Pa., to Elizabeth, Pa., furnished at my request the original tracings from which the blueprint maps accompanying their application were made. Copies of the triangulation notes and other survey data were also obtained from the same source.

The maps were checked by a triangulation system extended under my direction from the upstream end of the Pittsburg harbor survey. Results of this work show that the maps submitted by the applicants are substantially correct and reliable.

This part of the river is generally in its natural condition, having been changed very little by artificial filling. The channel depths are quite uniform and are about what is needed for navigation.

In laying down the harbor lines, the shore line at pool full was first averaged by a regular line drawn on the map. The harbor lines were placed generally 42 feet landward of this regulated low-water line and its elevation was made to correspond approximately with that of the Pittsburg harbor lines established in 1895, viz, 14 feet above pool-full surface at the top of a slope of one on three toward the river. It is considered that the foot of this slope at pool full (42 feet from the harbor line) should be generally at the average of the pool-full shore line in order to preserve the low-water widths and to bring the banks within reasonable distance of the water for landing and other purposes. Exceptions to this general rule are made at narrow places having a wide, low beach on one or both sides, in which cases the harbor line was moved farther back from the average low-water line, and in an extremely wide bend with excessive curvature where the curvature was flattened by placing the harbor line closer to the average low-water line.



On September 23, 1902, notices of a public hearing, to be held on October 3, 1902, for consideration of the proposed harbor lines, were sent to all parties interested, as shown on copy of the notice<sup>a</sup> herewith. Formal advertisement of the hearing was also made in four Pittsburg newspapers, and the matter was mentioned in the local news items in several papers.

Record<sup>a</sup> of the hearing is forwarded herewith. No objections or protests were made. The Pittsburg and Lake Erie Railroad Company desired a change of the bank slope near Belle Bridge, which has been made, as shown on the maps.

It is respectfully recommended that the harbor lines shown on the accompanying three sheets,<sup>a</sup> Monongahela River, Wilson, Pa., to Elizabeth, Pa., be approved by the Secretary of War.

The establishment of harbor lines in this reach of the river is, in the opinion of this office, essential to the preservation and protection of the harbor, and the location of the lines as shown on the sheets referred to above is such, in the opinion of this office, as to best preserve and protect the harbor.

If approved, the coordinates of the lines and description by metes and bounds will be prepared and forwarded as soon as practicable.

WM. L. SIBERT,  
*Captain, Corps of Engineers.*

[Sixth indorsement.]

OFFICE CHIEF OF ENGINEERS,  
U. S. ARMY,  
*January 31, 1903.*

Respectfully returned to the Secretary of War:

Application is made for the establishment of harbor lines on the left bank of the Monongahela River from Wilson to Elizabeth, Pa.

The matter has been under consideration by the local engineer officer, Captain Sibert, by whom a public hearing, previously advertised, was held, at which all interested parties were given an opportunity to present their views. From report in the preceding (third and fifth) indorsements it appears that the establishment of harbor lines at this locality is desirable and that the lines selected, which are for both sides of the river, are acceptable to all concerned.

It is recommended that these lines, which are delineated and described on the accompanying tracings,<sup>b</sup> be approved, and that the Secretary place his approval upon each of the four tracings which have been prepared for his signature.

G. L. GILLESPIE,  
*Brig. Gen., Chief of Engineers,*  
*U. S. Army.*

[Seventh indorsement.]

WAR DEPARTMENT,  
*February 3, 1903.*

Approved as recommended by the Chief of Engineers.

W. SANGER,  
*Assistant Secretary of War.*

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<sup>a</sup> Not printed.

<sup>b</sup> Maps not printed.

# 1702 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

## DESCRIPTION OF HARBOR LINES, MONONGAHELA RIVER, WILSON TO ELIZABETH, PA.

[*Explanations.*—The locations of points are designated by coordinates, which are the distances south (—X) and east (+Y) from the origin of the system at Davis Island Dam.

The "course" opposite any point is the harbor line to the point next below.

Azimuths of the tangents are the bearings of the lines upstream referred to true meridian, reading from 0 at north around to 360°, east being 90°, south 180°, and west 270°.

Distances are in feet.]

	Location of points.		Course.			
			Tangent.		Curve.	
	—X.	+Y.	Azimuth.	Length.	Radius.	Angle.
Right bank.....	a 65,421.17	50,338.14	118 19 29	500.00		" " "
	65,654.41	50,778.28			1,600	18 03 04
	65,824.33	51,250.07	100 16 25	73.25		
	65,837.30	51,322.15			3,440	57 17 31
	66,888.73	53,225.11	137 33 56	1,978.26		
	68,348.78	54,550.63			3,200	34 37 36
	70,073.27	55,368.50	172 11 34	1,043.76		
	71,107.34	55,510.29			3,540	36 16 06
	73,250.75	55,119.72	208 27 40	1,344.17		
	74,432.45	54,479.14			5,000	19 15 09
	75,748.50	53,447.63	227 42 49	1,119.19		
	76,501.62	52,619.66			6,400	8 21 04
	77,076.84	51,888.84	236 06 53	810.18		
	b 77,250.00	51,629.00				
	c 66,000.00	49,784.00	121 25 47	339.61		
Left bank.....	66,177.00	50,073.78			1,650	10 06 02
	66,305.90	50,333.59	111 20 45	373.02		
	66,441.76	50,681.01			2,400	6 27 06
	66,525.77	50,937.72	104 53 30	157.77		
	66,568.32	51,090.19			2,900	19 35 20
	66,979.44	51,966.66	124 28 59	365.17		
	67,202.17	52,812.40			2,900	10 29 52
	67,541.22	52,720.45	134 58 51	1,538.98		
	68,629.15	53,902.00			2,100	16 55 31
	69,125.63	54,177.13	151 54 22	241.91		
	69,339.04	54,291.05			2,900	18 58 06
	70,057.37	54,532.94	170 52 22	623.54		
	70,870.50	54,823.55			2,900	37 07 28
	72,081.85	54,900.83	207 50 56	1,365.50		
	73,897.51	53,719.79			5,700	16 27 00
	75,212.16	52,735.04	224 26 53	593.30		
	75,636.72	52,540.57			5,700	5 29 43
	76,006.04	51,996.62	229 56 39	957.15		
	d 76,024.00	51,207.00				

<sup>a</sup>This point is 235° 28' 05", 683.22 feet from triangulation station No. 86, a brass plate on concrete monument.

<sup>b</sup>This point is 53° 10' 31", 649.30 feet from triangulation station No. 106, an iron pipe in stone-filled crib.

<sup>c</sup>This point is 233° 29' 04", 10.06 feet from triangulation station No. 81, a brass plate on concrete monument.

<sup>d</sup>This point is 80° 54' 27", 179.49 feet from triangulation station No. 101, a brass plate on concrete monument.

WAR DEPARTMENT,  
Washington, February 3, 1903.

Approved.

WM. CARY SANGER,  
Assistant Secretary of War.

G G 12.

## MODIFICATION OF THE HARBOR LINES ON THE RIGHT BANK OF MONONGAHELA RIVER AT HAZELWOOD, PITTSBURG HARBOR, PENNSYLVANIA.

COMMITTEE ON WAYS AND MEANS,  
HOUSE OF REPRESENTATIVES,  
Washington, D. C., April 17, 1902.

DEAR SIR: I beg leave to submit herewith application <sup>a</sup> of Jones & Laughlins, Limited, for modification of harbor line on the Mononga-

<sup>a</sup>Not printed.

hela River at Hazelwood, accompanied by certain letters<sup>a</sup> of parties interested in such modification and in indorsement thereof. I submit also blue prints<sup>a</sup> of the plan, showing the proposed modification and surroundings. I am fully persuaded that the change asked for would not be in any respect detrimental to the interests of navigation and that it ought to be made as an act of justice to Jones & Laughlins, Limited. I sincerely hope that it may receive your favorable attention.

Very respectfully, yours,

JOHN DALZELL.

Hon. ELIHU ROOT,  
*Secretary of War.*

[Second indorsement.]

OFFICE CHIEF OF ENGINEERS,  
U. S. ARMY,  
*July 28, 1902.*

Respectfully returned to the Secretary of War.

Hon. John Dalzell submits, with request for favorable consideration, application of Jones & Laughlins, limited, for modification of the established harbor line on the right bank of Monongahela River in front of their property at Hazelwood, Pittsburg, Pa. The change desired is an abandonment of the present line for a length of about 4,000 feet and relocating the line nearer the river channel a distance of from 0 to 140 feet from the present location, in order that the company may use in connection with their business the intervening space, amounting to several acres.

A similar application was before the Department in 1900 and was reported upon adversely, first by the local officer then in charge, Maj. Chas. F. Powell, Corps of Engineers, and later by a Board of Engineer Officers consisting of Major Powell and Capt. H. F. Hodges, and Capt. Geo. A. Zinn, Corps of Engineers. The views of the Board were communicated to the applicants by War Department letter of August 4, 1900. The position taken by the Department was, in brief, that the existing harbor lines were adopted under authority of law which provided for the establishment of such lines for the preservation and protection of harbors, that the desired change was not for the better protection of the harbor interests, and that the facts presented by the applicants did not furnish sufficient grounds upon which to base a change under the law.

In his report of the 3d instant, herewith, the local officer now in charge, Capt. W. L. Sibert, Corps of Engineers, says:

No argument is seen that would justify in accordance with the law the location of harbor lines as Jones & Laughlins, Limited, desire them located.

On the accompanying blue print, however, he has indicated by a full yellow line a proposed modified line which will be a partial compliance with the request of the applicants, afford better facilities for the use of the harbor, and yet, in his opinion, fully preserve the usefulness of the harbor at this locality.

The views of Captain Sibert are concurred in by the division engineer and, for the reasons given, I recommend that the harbor line be changed and located as shown on sheet No. 1<sup>a</sup>, herewith. Should this action meet with approval, I further recommend that the Secretary place his approval upon the chart, which has been prepared for his signature.

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<sup>a</sup> Not printed.

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In this connection attention is invited to letter<sup>a</sup> herewith, dated July 3, 1902, from Jones & Laughlins, Limited, to Captain Sibert, in which the applicants signify their acceptance of the line proposed by him, and also agree to remove, within two years from date of adoption, all fill to the riverward of such line and above the specified slope.

A. MACKENZIE,  
*Acting Chief of Engineers.*

[Third indorsement.]

WAR DEPARTMENT, *August 15, 1902.*

Approved as recommended by the Acting Chief of Engineers.

WM. CARY SANGER,  
*Acting Secretary of War.*

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REPORT OF CAPT. W. L. SIBERT, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,  
*Pittsburg, Pa., July 3, 1902.*

Respectfully returned to the Chief of Engineers, U. S. Army.

This paper is a renewal of an application for a change of harbor line along the Monongahela River in front of certain property owned by the applicants. Previous similar applications have been reported on by Maj. Charles F. Powell, Corps of Engineers, and by a Board of United States Engineer officers unfavorably.

Those phases of the subject that pertain to the legality of the establishment of the present harbor lines, and to the violation of the law by Jones & Laughlins, Limited, in filling riverward of such line, having been fully reported on, and there being no new data in connection with said phases, this report will be confined to the questions as to whether or not the original locations of harbor lines at this place was such as to best preserve and protect the harbor, and, if not, what location would best so preserve that portion of the harbor.

An examination of the harbor-line maps above, below, and at the locality in question will show that the average width of stream between harbor lines for 6,000 feet above and for 6,000 feet below this locality is 900 feet, and that the average width between such lines for the 4,000 feet of river in question is 972 feet. The lines in question are along the upper half of a bend on the concave side.

On map No. 2<sup>a</sup> herewith are cross sections showing the heights and shape of the bank when harbor lines were originally established, the location of harbor lines and amount of unauthorized filling riverward of such lines, location of harbor lines as asked for, and proposed location of harbor lines. These sections show a low, flat beach, varying in width from 40 feet to 85 feet in front of a well-defined but low bank. A good navigable depth is shown along this beach and close up to it for 1,000 feet at the lower end of the reach in question. This beach has, according to such information as is obtainable, been made within the last fifty years. Fifty years ago a well-marked but low bank extended to near the water edge, as it was when the harbor lines were located. The cause of the erosion of the top layers of the soil was probably the combined effect of floods and waves of passing steamboats, possibly aided in some places by excavation of material for

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<sup>a</sup>Not printed.

brickmaking. The existence of this beach is indicative of the fact that the river at low and medium stages does not need an increased width of channel, and hence does not make it, and thus produce the bluff bank common in bends.

These sections show that the foot of the harbor-line slope was in some places as much as 80 feet from the river edge of this beach at places where there was sufficient depth for boats to land and transact business. Such a projecting beach prevents the full ordinary use of that portion of the harbor. At medium stages of water it is an obstruction to navigation, and at low-water stages it prevents boats from taking on and putting off freights advantageously.

In my opinion the proper location of a harbor line along such a bank is to so locate the line that the foot of the slope will be at the river edge of the beach, when such location does not give a width which, in connection with the slope, will produce a disturbance in the high-water flow. Such a location in this instance still leaves a width between harbor lines for the reach in question of from 15 to 50 feet more than in the reaches above and below it.

It might be argued that the projecting beach could be dredged away, making deep water to the foot of the harbor-line slope, with lines located as now. This would be giving the river a greater medium and low-water channel width than it has made or will maintain for itself, with the consequence that some portion of the resultant section would fill to the detriment of the harbor. Locating points of the harbor line in accordance with this line of reasoning at A and B and connecting by suitable curves with the established lines at C and D gives, in my opinion, the correct location of the harbor line so as to fully preserve the usefulness of the harbor in this locality.

It is respectfully recommended that the harbor lines be changed and located as shown on sheet No. 1<sup>a</sup> herewith.

No argument is seen that would justify, in accordance with the law, the location of harbor lines as Jones & Laughlins, Limited, desire them located.

The lines as recommended have been laid out on the ground and have been examined by Jones & Laughlins, Limited, and their agreement<sup>a</sup> to remove within two years all fill to the riverward of such lines and above the specified adopted slope is herewith.

W. L. SIBERT,  
*Captain, Corps of Engineers.*

(Through the Division Engineer.)

[Third indorsement.]

ENGINEER OFFICE, U. S. ARMY,  
CENTRAL DIVISION,  
*Cincinnati, Ohio, July 9, 1902.*

Respectfully forwarded to the Chief of Engineers, U. S. Army.

When last at Captain Sibert's office (May 15) I joined him in a careful investigation of this matter, and since receiving these papers have again given it mature consideration.

I concur in Captain Sibert's views and recommendations.

G. J. LYDECKER,  
*Colonel, Corps of Engineers,*  
*Division Engineer, Central Division.*

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<sup>a</sup> Not printed.

G G 13.

**MODIFICATION OF HARBOR LINES IN PITTSBURG HARBOR, PENNSYLVANIA, FROM SMITHFIELD STREET BRIDGE, MONONGAHELA RIVER, AROUND THE POINT TO TENTH STREET, ALLEGHENY RIVER.**

PITTSBURG, PA., *January 10, 1903.*

We, the undersigned, respectfully petition you to change the harbor lines along a portion of the Pittsburgh Harbor from its present location to a location that will make such line coincide with the high-water mark.

Commencing at the north end of the Smithfield Street Bridge, on the Monongahela River, and extending around the point between the Allegheny and Monongahela rivers to the foot of Tenth street, all within the city of Pittsburgh.

When the Union Bridge is raised to the height clearly shown in the recent hearings in that case as necessary, the portion of the harbor referred to in this case will be that in which the life and property of the navigation interests will seek protection during floods and ice, and the above part of this public highway should all be under the control of the General Government.

Were structures built out to the present lines, boats would have no mooring places in times of distress, and the harbor would be destroyed at the time when its need was the greatest. The bed of the stream is the same now as it was when the present location was made.

JAMES REES & SONS COMPANY,  
THOS. M. REES,  
*Vice-President, and 65 Others.*

Hon. ELIHU ROOT,  
*Secretary of War.*

[Second indorsement.]

OFFICE CHIEF OF ENGINEERS,  
U. S. ARMY,  
*January 31, 1903.*

Respectfully referred to Capt. W. L. Sibert, Corps of Engineers, for report.

To be returned.

By command of Brig. Gen. Gillespie:

A. MACKENZIE,  
*Colonel, Corps of Engineers.*

[Third indorsement.]

UNITED STATES ENGINEER OFFICE,  
*Pittsburg, Pa., February 5, 1903.*

Respectfully returned to the Chief of Engineers, United States Army.

The jurisdiction of the United States over the navigable waters of this country, as this office understands it, extends as far as the water goes, so long as it stays within the well-defined banks and so long as it is used or may be used in the transportation of interstate commerce.

The Congress of the United States, under the commerce clause of the Constitution, has complete control of such navigable waters, and its opinion as to the extent of jurisdiction landward of the low-water line is best determined by the following acts as to the bridging of navigable streams, namely: Act of March 3, 1887, and act of April 2,

1888, concerning bridging the Great Kanawha and Muskingum rivers. In these acts navigation above the highest water is specifically provided for. Whatever may be the extent of this jurisdiction landward of the low-water line, it is the opinion of this office that the harbor lines in the reach of river mentioned in this petition should be placed as far landward as the jurisdiction of the United States will permit, for the following reasons:

First. This portion of the harbor of Pittsburg constitutes the terminal facilities for all of the river business centering at Pittsburg from the Monongahela, Ohio, and Allegheny rivers, and its unobstructed use is necessary at all stages of the water, since these waters are navigable at all stages for some classes of boats, at least.

Second. This is the principal mooring place for the shipping centering at Pittsburg during floods and ice, and no structures should prevent boats from being properly moored and protected in this portion of the Pittsburg harbor. Were structures built out to the harbor line as it now exists, boats would be prevented from transacting business by not being able to reach the shore at all stages above 20 feet, and on some portions of the wharf at all stages above 13 feet. The river bank of the reach in question is a paved wharf, slope 1 on 6, from Smithfield street down the Monongahela River on the Pittsburg side to West street. Thence around the Point to the upper end of the Exposition Building in the Allegheny River the wharf is neither graded nor paved. From this point up the Allegheny to the foot of Ninth street the wharf is graded but not paved. This wharf belongs to all of the people of the city of Pittsburg and is under the control of the city government in so far as the riparian rights on it are concerned.

It is therefore respectfully recommended that this office be authorized, after due advertisement, to hold a public hearing, at which all sides of the question may be presented and discussed, and make its final report and recommendation after such hearing.

W. L. SIBERT,  
*Captain, Corps of Engineers.*

[Fourth indorsement.]

OFFICE CHIEF OF ENGINEERS,  
U. S. ARMY,  
*February 10, 1903.*

Respectfully returned to Captain Sibert. The recommendation made in paragraph 3 of the preceding indorsement is approved.

Attention is invited to the fact, however, that modification of harbor lines in growing industrial centers, especially moving a line landward, is a matter that must be treated with great care.

To be returned.

By command of Brig. Gen. Gillespie:

A. MACKENZIE,  
*Colonel, Corps of Engineers.*

[Fifth indorsement.]

U. S. ENGINEER OFFICE,  
*Pittsburg, Pa., April 14, 1903.*

Respectfully returned to the Chief of Engineers, U. S. Army.

A public hearing was held in this office, after due advertisement, on February 26, 1903, at which was considered the proposed change of

harbor line from Smithfield Street Bridge, on the Monongahela River, around the "Point" to the foot of Tenth street, Allegheny River. The stenographic record<sup>a</sup> of this hearing and all papers<sup>a</sup> submitted in the case at the hearing and since are forwarded herewith. Exhibit A<sup>a</sup> is the stenographic record. Exhibit B<sup>a</sup> comprises papers in favor of moving the line landward. Exhibit C<sup>a</sup> essentially comprises papers protesting against moving the lines in such manner as would interfere with the Pennsylvania Railroad's proposed connections.

There are also forwarded herewith two tracings,<sup>a</sup> on which are shown the changes of harbor lines in this case that this office recommends (Exhibit D.<sup>a</sup>)

The city of Pittsburg is the riparian owner and it has entered no objection against moving the harbor lines landward. Copy of a resolution of common council of the city of Pittsburg is inclosed in Exhibit B.<sup>a</sup> Practically all the protests against moving the harbor lines landward are based on such a change as would interfere with the Pennsylvania Railroad Company in making connection with its property at the "Point." The lines as recommended do not interfere with this connection, as will be seen by comparing Exhibit B, submitted by the Pennsylvania Railroad Company, and included in Exhibit C of this office, with line as recommended on the Allegheny wharf.

After the hearing tentative harbor lines were laid down by this office for examination and written protests were invited. Copy of notice<sup>a</sup> inclosed. (Exhibit E.<sup>a</sup>) The tentative line on the Monongahela wharf was not materially protested against. That on the Allegheny wharf was not protested against except from a point about opposite Evans alley and from there down river to its connection with the old harbor line near the exposition building, and this on account of the Pennsylvania Railroad connection. The pencil line on that map showing the Allegheny wharf is that part of the line first proposed by this office and objected to in protests.

The Pennsylvania Railroad has purchased much valuable property at the "Point" for warehouse and other purposes and expects to obtain authority from councils to connect with these warehouses by means of an elevated railroad outside of Duquesne Way. The present harbor line would have interfered in no way with that connection and the purchase of the property was certainly in a measure due to such location of the line, and while the line first proposed by this office would undoubtedly better preserve and protect the harbor of Pittsburg than the line recommended, it is believed that it is best and fair to accept the change as proposed by the Pennsylvania Railroad, thus enabling them to make the desired connection with an easier curve than would be practicable otherwise. A protest from James Rees & Sons Co. against this location from Evans alley downstream, Allegheny wharf, and in favor of a location further landward, is inclosed. (Exhibit B.<sup>a</sup>)

There are inclosed two photographs,<sup>a</sup> one showing the Monongahela wharf and old harbor line, and the other the Allegheny wharf and old harbor line. (Exhibit D.<sup>a</sup>)

W. L. SIBERT,  
*Captain, Corps of Engineers.*

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<sup>a</sup> Not printed.



[Eighth indorsement.]

OFFICE CHIEF OF ENGINEERS,

U. S. ARMY.

*May 18, 1903.*

Respectfully returned to the Secretary of War.

Application is made within for a modification of the established harbor line at Pittsburg, commencing at the north end of the Smithfield Street Bridge on the Monongahela River and extending around the point between the Monongahela and Allegheny rivers to Tenth street, on the Allegheny River, all in the city of Pittsburg, this request being made with a view to the better preservation and protection of Pittsburg Harbor.

This petition was referred for consideration by the local engineer officer, by whom a public hearing has been held and the matter thoroughly investigated.

From Captain Sibert's statements in third and fifth indorsements hereon, it would appear that the preservation and protection of the harbor would be enhanced by a modification of the existing harbor line between the points named. The line finally selected and recommended by him is a compromise adopted after a careful consideration of the claims and protests of certain conflicting interests.

Concurring in the views and conclusions of Captain Sibert, I recommend that the modified line presented by him, which is delineated and described on the accompanying tracings,<sup>a</sup> be approved by the Secretary of War. For the sake of convenience, it is further recommended that the Secretary place his approval upon both tracings.

G. L. GILLESPIE,

*Brig. Gen., Chief of Engineers,**U. S. Army.*

NOTE.—The lines referred to above and shown on the map mentioned were approved by the Assistant Secretary of War May 29, 1903, the approval being indicated on the map.

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G G 14.MODIFICATION OF HARBOR LINES IN ALLEGHENY RIVER AT  
PITTSBURG, PENNSYLVANIA.

OFFICE OF THE CHIEF OF ENGINEERS,

UNITED STATES ARMY,

*Washington, November 1, 1902.*

CAPTAIN: A request has been presented to the Chief of Engineers that Mr. William McConway be given an opportunity to present to you verbally certain facts and arguments bearing upon the application of Knox & Reed, attorneys for Fox Pressed Steel Company and others, for modification of harbor lines on the Allegheny River at Pittsburg.

Mr. McConway has been informed that you will be pleased to grant him such an interview at any time which may be mutually convenient.

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<sup>a</sup>Not printed.

1710 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

That all the facts may be available to you, the papers in the case are sent you herewith, to be returned when they have served their purpose.

By command of Brig. Gen. Gillespie:

Very respectfully, your obedient servant,

A. MACKENZIE,  
*Colonel, Corps of Engineers.*

Capt. W. L. SIBERT,  
*Corps of Engineers, Pittsburg, Pa.*

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REPORT OF CAPT. W. L. SIBERT, CORPS OF ENGINEERS.

ENGINEER OFFICE, UNITED STATES ARMY,  
*Pittsburg, Pa., March 21, 1903.*

GENERAL: Referring to letter from your office, dated November 1, 1902, relative to interview with Mr. William McConway about application of Fox Pressed Steel Company and others for change of harbor line on Allegheny River at Pittsburg, I have to report as follows:

In the first conversation with Mr. McConway on the subject he was informed that before a change of harbor line could be considered or recommended it was necessary to show that the preservation and protection of the harbor would be promoted thereby. Consequently Mr. McConway submitted the letter<sup>a</sup> of January 2, 1903, which is forwarded herewith.

I submit a new map<sup>a</sup> of the locality, showing soundings taken last year under direction of this office, which confirms statements in the above letter as to the shoals and filling up along the applicant's frontage. That the filling has been extensive since 1891 is shown by the shading between the old and recent low-water lines. The soundings give depths at the stage (elevation 703 feet) which will largely prevail during four to six months of every year when the movable dam at Herr Island (3 miles below) is necessarily lowered.

The McConway & Torley Company desire to transfer by river material and products between their two plants shown on this map. This firm and others of the applicants desire to obtain fuel and ship products by river. It is true that structures might be built under permits, reaching from the present harbor line to deeper water, but these would tend to increase deposits along that shore, and it would be almost impracticable to maintain them against the heavy ice movements common in this river.

In order to obtain sufficient boating depths at their respective landings considerable dredging will be necessary. Dredging will also be done under direction of this office to improve the channel depths along this reach.

Narrowing the river cross sections and changing the straight bank line to an advanced and more natural curved line around the point will greatly lessen the deposits and materially assist in maintaining dredged channels. Observed flood profiles show that the narrow section just above Forty-eighth street backs up the water above about 0.7 foot, which greatly increases the current through a part of this narrow place. A regular and more gradual reduction of the river

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<sup>a</sup>Not printed.

width from the wide section at upper end of the reach would distribute the slope on a greater length of the river and make its navigation at high stages easier.

For the reasons indicated above it is the opinion of this office that the moving of the existing harbor line to the line shown in yellow on the blueprint,<sup>a</sup> in duplicate, herewith would tend to the "preservation and protection of the harbor," and the change is recommended.

Representatives of the river interests have been consulted and they agree to this proposed change. A letter<sup>a</sup> from the applicants accepting the line in lieu of the one they asked for is herewith.

The inclosures forwarded with your letter of November 1, 1902, are herewith returned.

Very respectfully, your obedient servant,

WM. L. SIBERT,  
*Captain, Corps of Engineers.*

Brig. Gen. G. L. GILLESPIE,  
*Chief of Engineers, U. S. A.*

[Third indorsement.]

OFFICE CHIEF OF ENGINEERS,  
U. S. ARMY,  
May 7, 1903.

Respectfully submitted to the Secretary of War.

Harbor lines were established by the War Department on Allegheny River at Pittsburg, Pa., in 1895.

\* \* \* \* \*

Examinations made during the past season show that extensive shoaling has taken place at the point in question within the last few years. Owing to this fact and other considerations indicated in the within report the local officer, Captain Sibert, expresses the opinion that, while not fully conforming to the demands of the petitioners, a modified line as shown on the accompanying chart<sup>a</sup> would grant some relief and still tend to the preservation and protection of the harbor. This line has been accepted by the petitioners in lieu of the modification originally requested, and is reported to be satisfactory to the navigation interests on the river.

In view of the altered physical conditions as shown, I concur in the views of Captain Sibert that some concession may be granted the riparian owners, and recommend the approval by the Secretary of War of the modified harbor line shown on the tracing herewith, which has been prepared for his signature.

G. L. GILLESPIE,  
*Brig. Gen., Chief of Engineers,*  
*U. S. Army.*

NOTE.—The lines referred to above and shown on the map mentioned were approved by the Secretary of War under date of May 9, 1903, the approval being indicated on the map.

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<sup>a</sup> Not printed.



## APPENDIX H H.

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### CONSTRUCTION OF LOCKS AND MOVABLE DAMS IN OHIO RIVER BETWEEN THE PENNSYLVANIA STATE LINE AND CINCINNATI; IMPROVEMENT OF KANAWHA, LITTLE KANAWHA, ELK, AND GAULEY RIVERS, WEST VIRGINIA.

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REPORT FOR THE FISCAL YEAR ENDING JUNE 30, 1903, WITH OTHER  
DOCUMENTS RELATING TO THE WORKS. OFFICERS IN CHARGE,  
CAPT. W. E. GRAIGHILL AND MAJ. GEO. A. ZINN, CORPS OF ENGI-  
NEERS.

#### IMPROVEMENTS.

- |   |   |
|---|---|
| 1. Movable dams in Ohio River.  | 4. Kanawha River, West Virginia.  |
| 2. Little Kanawha River, West Vir-<br>ginia.  | 5. Operating and care of locks and dams<br>on Kanawha River, West Virginia. |
| 3. Operating and care of lock and dam<br>on Little Kanawha River, West<br>Virginia. | 6. Gauley River, West Virginia.   |
|   | 7. Elk River, West Virginia.  |
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UNITED STATES ENGINEER OFFICE,  
*Wheeling, W. Va., July 18, 1903.*

GENERAL: I have the honor to transmit herewith the annual report  
of the works under my charge for the fiscal year ending June 30, 1903.

The following assistant engineers were in local charge of the works:  
Charles Humphreys, Dams Nos. 8, 11, and 13, Ohio River; W. M.  
Hall, Dams Nos. 18 and 19, Ohio River, and Little Kanawha River;  
and Thos. E. Jeffries, Kanawha River.

Very respectfully, your obedient servant,

GEO. A. ZINN,  
*Major, Corps of Engineers.*

Brig. Gen. G. L. GILLESPIE,  
*Chief of Engineers, U. S. A.*

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#### H H I.

### MOVABLE DAMS IN OHIO RIVER.

OPERATIONS DURING THE FISCAL YEAR ENDING JUNE 30, 1903.

*Dam No. 8, about 46 miles below Pittsburg, Pa.*—The river and  
harbor act of June 13, 1902, provides for survey, acquisition of site,  
and construction of lock. A survey for this site was commenced in  
August and completed in December, 1902. Test holes were drilled  
from which good samples of the material penetrated could be taken  
(the rock, when found, in cores), so that the nature of the river bot-  
tom could be determined with some certainty. Sixty-nine of these

holes were drilled, which show a gravel while not so coarse as found higher up, still of a quality to insure a reasonably good foundation. Rock was found at 30 feet below low water. Approval was received for the location about 2 miles above Wellsville, Ohio. It was necessary to condemn two pieces of land for this site, but the proceedings have not been concluded. Plans for the entire work are in preparation.

*Dam No. 11, about 77 miles below Pittsburg, Pa.*—The act of June 13, 1902, contains a provision for this dam similar to that for Dam No. 8. Field work was commenced in August, 1902. Three available sites were surveyed, and 59 test holes drilled using the same process as at Dam No. 8. The general character of the material encountered was a rather fine gravel. A survey of the land required at the approved site (near Salt Run) and additional test holes are necessary.

*Dam No. 13, about 96 miles below Pittsburg, Pa.*—It has been found that the river bottom consists principally of fine sand, and that a further modification of the plans was necessary to provide a stable structure. Modified plans were submitted, and the Chief of Engineers appointed a Board of Engineer Officers to consider same. The Board recommended a pile foundation for that part of the walls not already built; protection of riprap, cribs, and sheet piling at exposed parts; a concrete floor for lock; omission of emptying valves from river wall, power and flushing conduits, drift chute, and two of the four Poirée dams. Plans in accordance with the Board's recommendation are in preparation.

During the year the following work was done under the contract with The Sheridan-Kirk Contract Company for building the masonry of lock: 13,902 cubic yards material excavated, and 396 cubic yards rubble masonry, 3,669 cubic yards concrete, 2,862 pounds iron, and 32,888 linear feet sheet piling placed. The power-house foundation is about three-fourths completed, and that for the river lock wall is built to a height of about 8 feet over a distance of 305 feet, and to about 12 feet for the remainder (310 feet).

*Dam No. 18, about 179 miles below Pittsburg, Pa.*—Land for this site was purchased and marked, and plans for the lock completed. Some current observations were taken.

A contract was entered into with The Evansville Contract Company, under date of November 21, 1902, for building the lock and guide walls. Active operations were commenced on April 27 and continued until the close of the year. During part of May and June work was carried on both night and day. At the close of the year the cofferdam (crib) was nearly completed and the excavation for the land and river walls and gate recesses well under way.

A temporary building, for the storage of cement, was constructed by J. W. Woods under an emergency contract.

*Dam No. 19, about 191 miles below Pittsburg, Pa.*—The river and harbor act of June 13, 1902, provides for survey, acquisition of site, and construction of dam. Field work was commenced on August 8 and completed December 1, 1902. Sixty-one test holes were drilled, using the same process as at Dam No. 8. The character of the material penetrated indicates a rock foundation for both lock and dam. The land required for this site has been surveyed and its acquisition is well under way.

Owing to the short seasons permitting work on the Ohio River each year (about six months), and to the lock, dam, and appurtenances belonging to practically one class of work (one contract could cover the entire work), it would be to the interests of the Government and

navigation that the construction of the entire work at each site be authorized, thus permitting the entering into of one contract. In this connection an expenditure of at least \$300,000 in any one year at each site should be authorized.

One contract covering the work at each site would, it is believed, prove a saving in cost and hurry its completion. It would obviate the delay usual in making new contracts; that caused by a new contractor for each piece of work (which has been the rule on this river) in collecting and erecting his plant; the duplicating of work, such as cofferdams, which could be constructed so as to permit of work on more than one structure at the same time. The time for delivery of material would be undoubtedly lessened, as the large quantities required would enable the contractor to place his orders with well-equipped and reliable dealers, which, in addition, would insure a saving in cost.

Another factor which should be considered is that men when once familiar with the work would likely remain until its completion if the contract were in the hands of one firm, whereas under the present system each contractor brings on new men, and by the time they are thoroughly qualified a new set are brought on with the next contractor. To carry on a work successfully men acquainted with the characteristics at each site are a necessity.

### *Money statement.*

#### CONSOLIDATED.

July 1, 1902, balance unexpended .....	\$721,887.91
Amount appropriated by sundry civil act approved March 3, 1903 ..	850,000.00
	<hr/>
	1,571,887.91
June 30, 1903, amount expended during fiscal year .....	102,729.33
	<hr/>
July 1, 1903, balance unexpended .....	1,469,158.58
July 1, 1903, outstanding liabilities .....	2,426.72
	<hr/>
July 1, 1903, balance available .....	1,466,731.86
	<hr/>
July 1, 1903, amount covered by uncompleted contracts .....	537,363.45
	<hr/>
{ Amount (estimated) required for completion of existing project ...	2,718,400.00
{ Amount that can be profitably expended in fiscal year ending June	
{ 30, 1905, in addition to the balance unexpended July 1, 1903 .....	1,293,400.00
{ Submitted in compliance with requirements of sundry civil act of	
{ June 4, 1897.	

#### DAM NO. 8.

July 1, 1902, balance unexpended .....	\$50,000.00
Amount appropriated by sundry civil act approved March 3, 1903 ..	200,000.00
	<hr/>
	250,000.00
June 30, 1903, amount expended during fiscal year .....	12,143.33
	<hr/>
July 1, 1903, balance unexpended .....	237,856.67
July 1, 1903, outstanding liabilities .....	135.00
	<hr/>
July 1, 1903, balance available .....	237,721.67
	<hr/>
July 1, 1903, amount covered by uncompleted contracts .....	660.49
	<hr/>
{ Amount (estimated) required for completion of existing project ..	600,000.00
{ Amount that can be profitably expended in fiscal year ending June	
{ 30, 1905, in addition to the balance unexpended July 1, 1903 .....	200,000.00
{ Submitted in compliance with requirements of sundry civil act of	
{ June 4, 1897.	

<sup>a</sup>Dam No. 13, repayment, \$0.50.

# 1716 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

## DAM NO. 11.

July 1, 1902, balance unexpended.....	\$50,000.00
Amount appropriated by sundry civil act approved March 3, 1903 ..	200,000.00
	<hr/>
June 30, 1903, amount expended during fiscal year .....	250,000.00
	10,081.06
	<hr/>
July 1, 1903, balance unexpended.....	239,918.94
July 1, 1903, outstanding liabilities.....	146.50
	<hr/>
July 1, 1903, balance available .....	239,772.44
	<hr/>
July 1, 1903, amount covered by uncompleted contracts.....	2,000.00
	<hr/>
{ Amount (estimated) required for completion of existing project... ..	600,000.00
{ Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903 .....	200,000.00
{ Submitted in compliance with requirements of sundry civil act of June 4, 1897.	

## DAMS NOS. 13 AND 18.

July 1, 1902, balance unexpended.....	<sup>a</sup> \$596,887.91
Amount appropriated by sundry civil act approved March 3, 1903 ..	450,000.00
	<hr/>
June 30, 1903, amount expended during fiscal year .....	1,046,887.91
	71,825.71
	<hr/>
July 1, 1903, balance unexpended.....	975,062.20
July 1, 1903, outstanding liabilities.....	2,020.22
	<hr/>
July 1, 1903, balance available .....	973,041.98
	<hr/>
July 1, 1903, amount covered by uncompleted contracts .....	534,702.96
	<hr/>
{ Amount (estimated) required for completion of existing project... ..	593,400.00
{ Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903 .....	593,400.00
{ Submitted in compliance with requirements of sundry civil act of June 4, 1897.	

## DAM NO. 19.

July 1, 1902, balance unexpended.....	\$25,000.00
June 30, 1903, amount expended during fiscal year .....	8,679.23
	<hr/>
July 1, 1903, balance unexpended.....	16,320.77
July 1, 1903, outstanding liabilities .....	125.00
	<hr/>
July 1, 1903, balance available.....	16,195.77
	<hr/>
{ Amount (estimated) required for completion of existing project.....	925,000.00
{ Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903 .....	300,000.00
{ Submitted in compliance with requirements of sundry civil act of June 4, 1897.	

## APPROPRIATIONS.

March 3, 1899:	
Construction of Dam No. 13.....	\$50,000
Construction of Dam No. 18.....	50,000
June 8, 1900, continuing construction of Dams Nos. 13 and 18 .....	470,000
March 3, 1901, continuing construction of Dams Nos. 13 and 18.....	40,000

<sup>a</sup> Dam No. 13, repayment, \$0.50.



June 13, 1902:	
Construction of Lock and Dam No. 8 .....	\$50,000
Construction of Lock and Dam No. 11 .....	50,000
Construction of Lock and Dam No. 19 .....	25,000
June 28, 1902, continuing construction of Dams Nos. 13 and 18 .....	46,600
March 3, 1903:	
Continuing construction of Lock at Dam No. 8 .....	200,000
Continuing construction of Lock at Dam No. 11 .....	200,000
Continuing construction of Dams Nos. 13 and 18 .....	450,000
Total .....	1,631,600

NOTE.—Act of June 13, 1902, appropriated \$50,000 each for Dams No. 8 and No. 11, instead of \$300,000 each, as reported in the annual report for 1902.

ABSTRACT OF CONTRACTS IN FORCE FOR IMPROVING OHIO RIVER BELOW  
PITTSBURG, PA.

*Lock for movable Dam No. 13.*

Contractor: The Sheridan-Kirk Contract Company.

Rate: Cofferdam at \$10 per linear foot; temporary piling, 35 cents per linear foot; sheet piling, 35 cents per linear foot; ordinary excavation, 30 cents per cubic yard; deposit excavation, 50 cents per cubic yard; channel dredging, 25 cents per cubic yard; rock excavation, \$3 per cubic yard; ordinary filling, 30 cents per cubic yard; stone filling, \$3 per cubic yard; special ashlar masonry, \$16 per cubic yard; coping masonry, \$17 per cubic yard; rubble masonry, \$5.50 per cubic yard; brick masonry, \$11 per cubic yard; concrete masonry (cement furnished by United States), \$2.85 per cubic yard; oak timber, \$50 per thousand; hemlock timber, \$35 per thousand; cast iron, 5 cents per pound; wrought iron, 5 cents per pound; steel, 5 cents per pound; iron pipe, 3-inch, 15 cents per linear foot.

Date of approval: July 5, 1901.

Date of beginning: September 7, 1901.

Date of expiration: 400 fair working days.

*Lock for movable Dam No. 18.*

Contractor: The Evansville Contract Company.

Rate: Grubbing and clearing at \$25 per acre; hemlock timber and plank, \$40 per thousand; sheet piling, \$45 per thousand; round timber, 25 cents per linear foot; round piling, 30 cents per linear foot; common filling, 27 cents per cubic yard; puddling, \$2 per cubic yard; stone filling, \$1.50 per cubic yard; common excavation, 25 cents per cubic yard; rock excavation, \$2.50 per cubic yard; concrete (cement furnished by United States), \$4 per cubic yard; oak timber, \$50 per thousand; paving, \$3.50 per cubic yard; curbing, \$7 per cubic yard; bolt holes, 50 cents per linear foot; iron and steel, 5½ cents per pound; vitrified pipe, 8-inch, 35 cents per linear foot; vitrified pipe, 12-inch, 50 cents per linear foot; galvanized-iron pipe, 3-inch, 60 cents per linear foot; galvanized-iron pipe, 2-inch, 40 cents per linear foot; galvanized-iron pipe, 1½-inch, 40 cents per linear foot; highway, 50 cents per square yard.

Date of approval: December 10, 1902.

Date of beginning: January 14, 1903.

Date of expiration: 300 fair working days.

*Portland cement at Dams Nos. 13 and 18.*

Contractor: Atlas Portland Cement Company.

Rate: In wood at \$2.34 per barrel.

Date of approval: May 6, 1903.

Date of beginning: When notified.

Date of expiration: December 31, 1903.

# 1718 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

## *Natural cement at Dam No. 13.*

Contractors: L. S. McKallip & Co.  
 Rate: In paper bags at 81 cents per barrel.  
 Date of approval: July 29, 1901.  
 Date of beginning: When notified.  
 Date of expiration: December 31, 1902, or on completion of construction work.

## *Drilling test holes at Dam No. 13.*

Contractor: C. F. Preslar Manufacturing Company.  
 Rate: Through loose material at \$2.50 per linear foot; through rock, \$3.50 per linear foot.  
 Date of contract: January 7, 1902.  
 Date of beginning: January 17, 1902.  
 Date of expiration: 60 fair working days.

## *Drilling test holes at Dams Nos. 8 and 11.*

Contractor: The Preslar-Crawley Manufacturing Company.  
 Rate: Through loose material at \$3 per linear foot; through hard material, \$5 per linear foot.  
 Date of contract: July 31, 1902.  
 Date of beginning: August 30, 1902.  
 Date of expiration: 150 fair working days.

*Freight handled at the wharves of some of the principal cities between Dam No. 8 and Dam No. 19, Ohio River, during the calendar year 1902.*

Name of city.	Freight.	Passengers.
	<i>Tons.</i>	<i>Number.</i>
East Liverpool, Ohio.....	13,200	16,000
Steubenville, Ohio.....	21,560	25,000
Wheeling, W. Va.....	136,000	65,000
Marietta, Ohio.....	5,143	7,070
Parkersburg, W. Va.....	100,000	10,000

The number of passengers includes excursionists.

## H H 2.

### IMPROVEMENT OF LITTLE KANAWHA RIVER, WEST VIRGINIA.

The river and harbor act of June 13, 1902, provided \$1,000 for maintenance and the preparation of an estimate of the probable cost of each of the four locks and dams in said river not owned by the Government and a report as to their present condition, probable cost of repair, and the advisability of acquiring the same in the interest of navigation.

Almost all of the required data has been collected for preparing the estimate and report called for by the above-mentioned act.

Preparations are under way for commencing the removal of obstructions which have re-formed.

Five hundred dollars can be profitably expended on this river each year in removing obstructions and maintaining the channel.

The commercial statistics are contained in the report for operating and care of lock and dam on Little Kanawha River, West Virginia.

*Money statement.*

July 1, 1902, balance unexpended .....	\$1,171.74
Amount received from sale .....	61.10
	<hr/>
	1,232.84
June 30, 1903, amount expended during fiscal year .....	138.08
	<hr/>
July 1, 1903, balance unexpended .....	1,094.76
	<hr/>
{ Amount that can be profitably expended in fiscal year ending June 30, 1905, for maintenance of improvement, in addition to the balance unexpended July 1, 1903 .....	1,000.00
{ Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

## APPROPRIATIONS.

August 14, 1876 .....	\$7,300	August 11, 1888 .....	\$25,000
June 18, 1878 .....	18,000	September 19, 1890 .....	40,000
March 3, 1879 .....	18,000	June 3, 1896 .....	1,500
June 14, 1880 .....	15,000	March 3, 1899 .....	748
March 3, 1881 .....	40,000	June 13, 1902 .....	1,000
August 2, 1882 .....	31,000		
August 5, 1886 .....	16,875	Total .....	214,418

NOTE.—Received from sale, \$61.10.

## H H 3.

## OPERATING AND CARE OF LOCK AND DAM ON LITTLE KANAWHA RIVER, WEST VIRGINIA.

Lock and Dam No. 5 is located about 41 miles from the mouth of the river (Parkersburg), and is a continuation of the slack-water system controlled by the Little Kanawha Navigation Company. The locks and dams (four) owned by the navigation company often cause a stoppage of navigation, owing to their leaky condition. During the past fiscal year navigation was suspended 42 days on account of low water, 20 days on account of ice, and 11 days on account of floods. The suspension caused by low water is almost entirely due to the bad condition of the locks and dams below, owned by the navigation company.

As this lock has been in operation for over eleven years, the repairs necessary to keep the lock and dam and their appurtenances in good condition are increasing, some parts requiring entire renewal. During the past year repairs were made to the valves, the crib below, and the pavement back of lock; some of the timbers and stone filling were replaced in the dam and its abutment repointed; drains were laid from the lock houses; and additional protection added to river banks. At the close of the year the lock, dam, and appurtenances (except storehouse) were in good condition. Praise is due the lock master and his assistant for the creditable appearance of this work and its surroundings.

# 1720 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

Table of important features of locks and dams, Little Kanawha River, West Virginia.

No. of lock and dam.	Distance from mouth of river.	Lock.					Dam.				
		Clear width.	Available length.	Length between quoins.	Tide reference.		Style.	Tide reference.		Normal lift.	When finished.
					Miter sill.	Top of wall.		Lower pool.	Upper pool.		
	Miles.	Feet.	Feet.	Feet.						Feet.	
1	3½	23	125	143	562.36	.....	Fixed, stepped, crib.	563.61	579.34	15.73	1874
2	14½	23	125	143	575.34	.....	do	579.34	599.52	10.18	1874
3	25½	23	125	143	585.52	.....	do	599.52	601.34	11.82	1874
4	31	23	125	143	597.34	.....	do	601.34	613.34	12	1874
5	40½	26	128	145	609.34	633.59	do	613.34	625.34	12	1891

## ALLOTMENTS.

November 28, 1891	\$1,500.00
July 15, 1892	4,426.65
July 21, 1893	3,837.97
July 16, 1894	3,491.03
July 20, 1895	3,378.17
July 24, 1896	830.72
July 23, 1897	1,684.03
August 3, 1898	3,038.53
July 21, 1899	2,331.58
July 14, 1900	2,271.61
June 25, 1901	3,470.84
July 12, 1902	2,705.25
Total	32,966.38

Summary of expenditures for operating and care of lock and dam on Little Kanawha River, West Virginia, for the fiscal year ending June 30, 1903.

Office expenses and superintendence	\$285.91
Labor	1,286.76
Fuel	9.00
Expenses	17.28
Repairs	485.02
Total	2,063.97

## COMMERCIAL STATISTICS.

Commerce that has passed Lock No. 5 since it was opened to navigation.

	Tons.		Tons.
Fiscal year—		Calendar year—	
1890	140,115	1897	127,943
1891	190,688	1898	122,405
1892	244,254	1899	138,664
1893	137,072	1900	119,439
1894	106,412	1901	122,190
1895	179,240	1902	69,706
1896	105,212		
1897	176,169		

*Detailed statement of commerce for calendar year 1902.*

Articles.	Amount.	Articles.	Amount.
	<i>Tons.</i>		<i>Tons.</i>
Brick .....	11	Live stock .....	1
Carbon black .....	739	Lumber .....	606
Casing .....	5	Merchandise, miscellaneous .....	1,415
Cattle .....	5	Oil .....	51
Coal .....	219	Poultry .....	1
Coke .....	15	Produce .....	1
Corn .....	9	Salt .....	70
Dry goods .....	10	Saw logs .....	38,363
Eggs .....	4	Shooks .....	35
Farm products .....	1,844	Staves .....	10
Flour .....	151	Straw .....	2
Furniture .....	4	Sugar .....	5
Groceries and paints .....	97	Sundries .....	109
Hardware .....	113	Telephone poles .....	150
Hay .....	99	Ties, railroad .....	21,261
Hides .....	1	Timber .....	4,457
Honey .....	4		
Horses .....	8	Total .....	69,706
Iron, manufactured .....	332		

Number of passengers, 5,762.

*List of stern-wheel boats plying on the Little Kanawha River, West Virginia, during calendar year 1902.*

Name of boat.	Length.	Breadth.	Depth.	Tonnage.
	<i>Feet.</i>	<i>Feet.</i>	<i>Feet.</i>	
<b>Steamboats:</b>				
Darling .....	100	22.7	3.6	78.8
Burnadina King .....	90	18	3.5	106
Oneida .....	104	19.5	4.2	75.78
Telephone .....	98	16	2.6	73
Louise .....	108	21.6	3	77
Excel .....	95	18	3	60
<b>Boats propelled by gasoline:</b>				
Clipper .....	75	8	1.7	10
Calhoun .....	70	8	2	10
Edith H .....	60	9	2	12
Creston .....	65	9	2.4	12
A. C. Barney .....	75	10	2	12
Hurricane .....	65	7.5	1.8	10
Mabel B .....	80	7.5	1.7	10
Carbon Black .....	85	7.5	2	10
H. B. Stout .....	85	7.5	2	10
Orion .....	50	7.5	2	6
Winona .....	85	7.5	2	10

*Report of lockages at Lock No. 5, Little Kanawha River, West Virginia, for the calendar year ending December 31, 1902.*

Steamboats .....	1,223
Barges and flats .....	196
Rafts .....	1,364
Miscellaneous .....	57
Total .....	2,840
Number of lockages .....	2,720

## H H 4.

## IMPROVEMENT OF KANAWHA RIVER, WEST VIRGINIA.

The new towboat *James Rumsey*, which had been building since January 9, 1901, was launched by Charles Ward, the contractor, January 4, and completed April 24, 1903, at a cost of \$28,000.

# 1722 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

As this boat is a departure from the usual towboats on inland rivers in this country, the following description is given:

Length, 120 feet; width, 24 feet; draft, about 30 inches; hull of steel with 4 bulkheads, making 5 water-tight compartments in the hold. Deck of best quality white pine. Coal bunkers on each side of engine room.

Boiler of water-tube class furnishes steam for 425-horsepower engine at 300 pounds pressure, and tested at 400 pounds pressure per square inch.

Engines are two quadruple expansion condensing engines, developing 425-horsepower when running at 300 revolutions per minute. Diameter of cylinders, 7, 10, 14, and 20 inches; stroke of piston, 12 inches.

Fitted with steam capstans and with three balanced steel rudders.

The boat is equipped with all necessary auxiliary engines, pumps, condenser, etc.

Twin screws of about 4 feet 3 inches diameter, working in semicircular recesses or tunnels in the hull, thus allowing the use of propellers of greater diameter than the draft of the boat.

Cabin, with staterooms for officers and crew, bathrooms, water-closets, etc. Pilot house over cabin.

Height of cabin roof above water line, 14 feet 5 inches; height of top of pilot house above water line, 23 feet 9 inches; height of whistle above water line, 29 feet; and height of smokestack above water line, 41½ feet.

It is estimated that about 1½ pounds of coal will be used per indicated horsepower per hour, varying according to speed, etc. The trials showed the following results: mean indicated horsepower, 454.7, gave mean speed 13.05 miles per hour; mean I. H. P., 388.8, mean speed, 12.62; mean I. H. P., 205.1, mean speed, 11.12.

It is found that the boat handles well without a tow, steering either right or left, backing or coming ahead. She does not, however, handle so well with a full tow; still her performance in this is creditable. The towboat is still under trial at the close of the year.

Joseph M. Neil, under his contract for building twelve additions to lock houses, completed the additions at Locks Nos. 7 and 8. Owing to his failure to make the progress required under the terms of the contract, upon its expiration the contract was annulled and the additions completed by hired labor.

A contract was entered into with Riley E. and Frank C. Williams for constructing three guard cribs at Lock No. 3. About three-fourths of this work is completed.

The dredge, crane boat, and towboat belonging to this river were employed in dredging in the pools and lock approaches. During the year 14,166 cubic yards of material was removed. A new dump scow was received for use in connection with the dredge.

Porch additions to lock houses were built at Locks Nos. 5, 7, and 11; seventeen cisterns were completed at Locks Nos. 2, 3, 4, 5, 6, 7, 10, and 11, and a retaining wall was built at No. 11.

Considerable new work is still necessary to place this river in good condition, a project for same having been submitted.

The commercial statistics for this river are given in the report for operating and care of locks and dams on Kanawha River.

## Money statement.

July 1, 1902, balance unexpended .....	\$172,649.73
June 30, 1903, amount expended during fiscal year .....	28,369.52
July 1, 1903, balance unexpended .....	144,280.20
July 1, 1903, outstanding liabilities .....	1,523.72
July 1, 1903, balance available .....	142,756.48
July 1, 1903, amount covered by uncompleted contracts .....	5,101.92

## APPROPRIATIONS.

March 3, 1873 .....	\$25,000	August 5, 1886 .....	\$187,500
June 23, 1874 .....	25,000	August 11, 1888 .....	350,000
March 3, 1875 .....	300,000	September 19, 1890 .....	300,000
August 14, 1876 .....	270,000	July 13, 1892 .....	225,000
June 18, 1878 .....	222,000	March 3, 1893 .....	500,000
March 3, 1879 .....	150,000	March 2, 1895 .....	580,700
June 14, 1880 .....	200,000	June 4, 1897 .....	273,000
March 3, 1881 .....	200,000		
August 2, 1882 .....	200,000	Total .....	4,208,200
July 5, 1884 .....	200,000		

## H H 5.

OPERATING AND CARE OF LOCKS AND DAMS ON KANAWHA RIVER,  
WEST VIRGINIA.

The slack-water system of the Kanawha River consists of ten locks and dams, of which two are fixed and eight movable, and provides for 6-foot navigation over a distance of about 90 miles from Point Pleasant upstream. As mentioned in the last annual report, the cost of maintaining this system is increasing, owing to its length of service. This is especially true at the movable dams, the first of which (Nos. 4 and 5) were completed in 1880, and the last (Nos. 9, 10, and 11) in 1898. At the close of the year the works were in practically good condition.

The movable dams were operated without serious accident or delay, as follows: Dams Nos. 4–10, raised three times and lowered three times; Dam No. 11, raised five times and lowered five times.

Navigation was suspended at the fixed dams about seventeen days, owing to high water, ice, and repairs.

The following is a summary of the work accomplished:

*Lock No. 2.*—Eighty feet of fence was built; seven check posts set on lock walls; 200 cubic yards of stone placed as bank protection above abutment of dam; and 521 cubic yards of stone filled in washout below abutment. New gates for this lock are under construction.

*Lock No. 3.*—Repairs to lower gates of lock were finished; 224 feet of fence built; two lock houses repaired and painted; paving below abutment of dam and dam repaired.

*Lock No. 4.*—The gates built in 1900 became swollen to such an extent as to make it impossible to operate them. The necessary alterations to gates were made and the lock walls repointed. Fifteen new wickets were placed in the navigation pass of dam.

*Lock No. 5.*—A set (sixty-two) of new wickets was built and placed in navigation pass of dam; two chocks were set on lock walls; and 824 feet of fence built. New trestles for service bridge of dam are under contract.

*Lock No. 6.*—Repairs were made to fourteen wickets of navigation pass of dam and twenty-five new weir wickets placed; five chocks and eight check posts were placed on the lock walls; and 1,504 feet of fence built. New gates for this lock are under construction.

*Lock No. 7.*—As protection to the river banks; 576 cubic yards of stone was placed. Four lock houses were painted; five chocks and six check posts placed on lock walls; and 2,408 feet of fence built.

*Lock No. 8.*—The bank at head of lock was graded and riprapped, three lock houses were painted and one papered; two chocks and six check posts placed on lock walls; and 1,840 feet of fence built.

## 1724 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

*Lock No. 9.*—Damage was done to the weir of this dam by an old fuel flat floating over it and knocking off nine wickets on June 9. The damage was repaired without interference with navigation. At the foot of the lock, 122 cubic yards of riprap was reset; one lock house painted; and 1,680 feet of fence built.

*Lock No. 10.*—Three lock houses were papered and painted, and 1,512 feet of fence built.

*Lock No. 11.*—One lock house was repaired and painted, and 1,360 feet of fence built.

*United States telephone line.*—The following repairs were made to keep the line in good condition: set 180 new poles, reset 176 old poles, and strung 24 miles of wire.

In addition to the work reported under improving Kanawha River, the Government dredge, crane boat, and towboat removed 48,725 cubic yards of sediment, 49 snags, 30 large stones, and 1 wreck (barge).

On July 9, 1902, the dredge was disabled. While lifting the boilers from wrecked steamer *Kanawha Belle*, one guy rod of the dredge broke and allowed the A-frame to fall which broke as did the gallows frame. The repairs were not completed until September 6.

The towboat *James Rumsey*, purchased partly from the allotment for operating and care, is described in the report on improving Kanawha River.

Repairs were made to the United States launch *Mascot*. This boat is used principally in transporting employees. A new service boat and two push boats were received.

By maneuvering the dams about 1,250,000 bushels of coal was assisted in reaching Ohio River ports.

Table of important features of locks and dams, Kanawha River, West Virginia.

## LOCKS.

Number of lock.	Distance from mouth of river.	Original low water.	Clear width.	Available length.	Length over all.	Length between quoins.	Tide reference.	
							Miter sill.	Top of wall.
	Miles.		Feet.	Feet.	Feet.	Feet.		
2	84½	585.46	50	271	377	306	578.75	609.75
3	79½	571.22	50	272	381	312	566.75	596.75
4	73½	564.44	50	274	385	300	559.75	579.75
5	67½	556.22	50	274	385	300	552.50	572.50
6	54	548.64	55	313	410.5	342	543.75	565.50
7	44	539.68	55	313	411	342	535.50	555.50
8	36	531.27	55	313	411	342	526	547.25
9	25½	523.64	55	313	411	342	520.50	539.50
10	19	517.41	55	313	411	342	514	533
11	1½	510.08	55	313	411	342	504	526

## DAMS.

Number of dam.	Style.	Length of pass.	Length of weir.	Height of pass trestle.	Length of wickets.			Tide reference.			Normal lift.	When finished.
					Pass.	Weir.		Pass sill.	Weir sill.	Upper pool.		
		Feet.	Feet.	Ft. in.	Ft. in.	Ft. in.					Feet.	
2	Fixed									597.75	10.83	1887
3	do									587.42	13.67	1882
4	Movable	248	210	16 2½	13 9	6 3½		561	567.75	573.75	7.25	1880
5	do	250	265.5	17 ½	13 10	5 3		553.50	561.50	566.50	7.50	1880
6	do	248	310	16 ¾	13 5½	7 7		546.50	552	559	8.50	1886
7	do	248	318	16 9½	14 ½	9 2½		537.50	542	550.50	8.25	1886
8	do	248	292	16 9½	14 ½	9 2½		529.25	538.75	542.25	8	1886
9	do	248	284	16 9½	14 ½	9 2½		521.25	525.75	534.25	6.25	1886
10	do	248	284	16 9½	14 ½	9 2½		515	519.50	525	7	1886
11	do	304	364	16 9½	14 ½	9 2½		508	512.50	521	10.92	1886

NOTE.—Upper miter sill: Lock No. 2 = 589.75; Lock No. 3 = 573.75. Top of wall at head of Lock No. 8 = 601.25



## ALLOTMENTS.

For fiscal year 1885.....	\$7,075.00	July 25, 1896.....	\$37,082.59
For fiscal year 1886.....	8,710.00	August 2, 1897.....	22,700.77
July 8, 1886.....	11,170.00	July 26, 1898.....	36,331.90
June 17, 1887.....	13,289.00	September 29, 1898.....	2,650.00
February 4, 1888.....	3,549.70	June 2, 1899.....	14,000.00
August 16, 1888.....	19,990.02	August 2, 1899.....	36,416.13
July 11, 1889.....	19,261.61	April 10, 1900.....	1,400.00
July 16, 1890.....	25,702.27	July 13, 1900.....	49,444.47
October 9, 1890.....	3,400.00	July 3, 1901.....	47,506.31
July 14, 1891.....	19,453.00	May 16, 1902.....	2,500.00
July 6, 1892.....	21,891.64	June 23, 1902.....	9,500.00
July 12, 1893.....	24,549.41	July 17, 1902.....	52,859.86
July 10, 1894.....	30,600.00		
July 2, 1895.....	30,200.00	Total.....	551,233.68

## ABSTRACT OF CONTRACTS IN FORCE FOR KANAWHA RIVER, WEST VIRGINIA.

*Towboat*

Contractor: Charles Ward.

Rate: \$28,000.

Date of approval: January 4, 1901.

Date of beginning: January 29, 1901.

Date of expiration: December 9, 1901 (extended for reasonable period).

*Guard cribs (3) at Lock No. 3.*

Contractors: Riley E. Williams and Frank C. Williams.

Rate: Timber and plank at \$29.75 per thousand; stone filling, \$2.90 per cubic yard; driftbolts and spikes, 5 cents per pound.

Date of approval: September 12, 1902.

Date of beginning: October 14, 1902.

Date of expiration: 150 fair working days.

*White-oak gate timber.*

Contractor: W. H. Wiseman.

Rate: \$29.95 per thousand.

Date of approval: September 29, 1902.

Date of beginning: November 2, 1902.

Date of expiration: March 2, 1903 (extended for reasonable period).

*Lumber and posts.*

Contractor: W. H. Wiseman.

Rate: Yellow-poplar lumber at \$29.95 per thousand; white-pine lumber, \$29.96 per thousand; locust or cedar posts, 96 cents each.

Date of approval: March 27, 1902.

Date of beginning: May 4, 1902.

Date of expiration: July 4, 1902 (extended for reasonable period).

*Thirty-four steel trestles, complete, for Dam No. 5.*

Contractors: B. Wallis &amp; Co.

Rate: 6.5 cents per pound.

Date of approval: February 14, 1903.

Date of beginning: March 10, 1903.

Date of expiration: July 9, 1903 (time limit waived).

# 1726 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

## *Summary of expenditures for operating and care of locks and dams on Kanawha River, West Virginia, for the fiscal year ending June 30, 1903.*

Office expenses and superintendence .....	\$7,748.65
Labor .....	37,474.19
Fuel .....	635.53
Expenses .....	898.62
Repairs .....	27,632.64
<b>Total</b> .....	<b>74,889.63</b>

### COMMERCIAL STATISTICS.

## *Statement of number of tons of coal, including that manufactured into coke, shipped by river from mines on the Kanawha (below Kanawha Falls) for the several years named.*

Date.	Shipment.	Date.	Shipment.
<b>Fiscal year—</b>	<b>Tons.</b>	<b>Fiscal year—</b>	<b>Tons.</b>
1875 .....	161,932	1892 .....	1,071,511
1876 .....	200,962	1893 .....	919,380
1877 .....	207,846	1894 .....	1,032,840
1881 .....	335,143	1895 .....	879,304
1883 .....	514,818	1896 .....	922,000
1884 .....	736,843	1897 .....	848,600
1885 .....	712,493	<b>Calendar year—</b>	
1886 .....	714,465	1897 .....	650,680
1887 .....	929,335	1898 .....	1,069,160
1888 .....	804,025	1899 .....	942,800
1889 .....	1,076,372	1900 .....	1,240,680
1890 .....	968,462	1901 .....	1,370,180
1891 .....	1,080,454	1902 .....	937,880

## *Tonnage of the Kanawha River for the calendar year ending December 31, 1902.*

Articles.	Quantity.	Tonnage.
Coal .....	bushels 23,447,000	937,880
Timber .....	feet B. M. 23,224,000	38,707
Staves, oak .....	number 283,000	2,123
Bark and wood for tanning .....	cords 4,900	9,555
Hoop poles .....	number 568,000	1,430
Laths .....	do 1,883,700	372
Railroad ties, oak .....	do 356,000	37,973
Shingles .....	do 456,000	68
Brick .....	do 572,800	1,432
Salt .....	barrels 6,410	897
Merchandise and produce in steamboats .....	tons .....	60,370
<b>Total</b> .....		<b>1,090,797</b>

## *Total tonnage of the Kanawha River for the several years named.*

	Tonnage.		Tonnage.
<b>Year ending June 30—</b>		<b>Calendar year—</b>	
1890 .....	1,127,232	1897 .....	832,002
1891 .....	1,235,355	1898 .....	1,244,334
1892 .....	1,390,750	1899 .....	1,124,364
1893 .....	1,116,537	1900 .....	1,475,930
1894 .....	1,222,530	1901 .....	1,547,610
1895 .....	1,082,342	1902 .....	1,090,797
1896 .....	1,162,782		
1897 .....	1,124,843		

The decrease in tonnage for the year 1902 is caused by the prevalence of the coal strike.

*Commerce passing each of the ten locks and dams in Kanawha River, West Virginia, during the calendar year ending December 31, 1902.*

Articles.	Lock No. 2.	Lock No. 3.	Lock No. 4.	Lock No. 5.	Lock No. 6.
Coal..... bushels	480,000	1,619,500	6,205,000	10,720,500	15,954,000
Coke..... tons	1,500	1,500	1,500	1,500	1,500
Lumber, etc..... feet	287,500	317,145	597,300	483,700	5,147,430
Shingles..... number	110,000	211,250	277,300	331,200	124,000
Laths..... do			15,000	38,000	67,700
Brick..... do	6,850	48,350	142,950	117,750	281,000
Miscellaneous freight..... tons	4,510	6,184	10,291	17,750	16,511
Steamboats..... number	1,148	1,254	1,641	1,734	1,866
Coal barges..... do	94	262	785	1,659	2,338
Other craft..... do	56	105	186	132	128
Passengers..... do	7,093	8,216	14,731	15,333	20,944
Salt..... barrels	64	114	248	1,075	2,573
Railroad ties..... number					37,010
Staves..... do					23,000
Hoop poles..... do	10,000				3,000
Bark..... cords					170
Lockages..... number	1,199	1,393	985	1,106	1,033
Dams up..... number days			195	196	193

Articles.	Lock No. 7.	Lock No. 8.	Lock No. 9.	Lock No. 10.	Lock No. 11.
Coal..... bushels	15,875,000	19,145,600	22,145,350	22,333,400	22,715,100
Coke..... tons	1,500	1,500	1,500	1,500	1,500
Lumber, etc..... feet	6,409,645	9,144,000	8,214,450	8,888,600	12,027,112
Shingles..... number	211,000	224,500	233,000	182,000	129,500
Laths..... do	1,756,000	1,480,200	1,323,500	1,623,200	1,984,000
Brick..... do	263,050	320,700	308,500	459,000	455,000
Miscellaneous freight..... tons	18,268	18,736	22,880	24,731	29,671
Steamboats..... number	1,819	1,978	1,851	1,924	2,033
Coal barges..... do	2,677	3,196	3,606	3,588	3,631
Other craft..... do	241	237	237	253	294
Passengers..... do	17,746	16,965	13,024	17,114	19,658
Salt..... barrels	3,702	4,007	3,703	5,668	5,355
Railroad ties..... number	56,899	118,760	224,220	285,725	355,985
Staves..... do	265,500	127,500	219,870	269,200	283,000
Hoop poles..... do	289,000	345,000	404,000	399,000	568,000
Bark..... cords					
Lockages..... number	1,150	1,236	1,225	1,200	916
Dams up..... number days	194	191	188	176	141

*List of steamboats plying Kanawha River, West Virginia, for the calendar year 1902.*

[All stern-wheel except as noted.]

Name of boat.	Character.	Length.	Breadth.	Depth.	Ton-nage.
		<i>Feet.</i>	<i>Feet.</i>	<i>Feet.</i>	
Sunshine.....	Packet	200	38.5	5	535
Kanawha.....	do	185	35	4	429.07
Lizzie Bay.....	do	181	30.8	4	198
Henry M. Stanley.....	do	180	32.4	5.5	293.71
Greenwood.....	do	165	32	4.5	270
Columbia.....	do	156	24.2	4	197.96
Helen M. Gould.....	do	140	25	4	149.40
Cricket.....	do	132	18	3	65
Argand.....	do	130	24.8	4	96
Baxter.....	do	121	22	3.5	75
Evergreen.....	do	120	22	4	99
Calvert.....	do	120	20	3.5	110
Neva.....	do	117	21.6	3.4	71.48
Mildred.....	do	116	24	3	92
Enos Taylor.....	do	116	20	3.5	64
T. D. Dale.....	do	111.6	19.7	3.2	85.77
Antoinette.....	do	100.7	19.9	3.9	54
Katy Mc.....	do	98.1	18	2.8	41
Unique <sup>a</sup> .....	do	90	14	4.6	33
Venus.....	do	90	18	3.6	49
Champion No. 2.....	do	76	22.8	3.4	52
Genevieve.....	do	59	11.9	2.6	14.44

<sup>a</sup> Screw propeller.

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*List of steamboats plying Kanawha River, West Virginia, for the calendar year 1902—Continued.*

Name of boat.	Character.	Length.	Breadth.	Depth.	Ton- nage.
		<i>Feet.</i>	<i>Feet.</i>	<i>Feet.</i>	
Laura <sup>a</sup> .....	Packet.....	57	10	3.5	9.60
Edwin.....	do.....	50	10.5	2.5	33
Ensign <sup>a</sup> .....	do.....	41.7	12	3.8	9
E. R. Andrews.....	Towboat.....	165	32.5	5.2	351.07
Florence Marmet.....	do.....	155	30	5	293
Robert P. Gillham.....	do.....	149.5	31.5	4.3	158
Otto Marmet.....	do.....	149.5	24	4.8	135.20
Convoy.....	do.....	146	28.5	3.7	170.53
Mount Clare.....	do.....	134.5	25.8	4.8	191.36
Val P. Collins.....	do.....	132.6	24.6	4.8	119
J. B. Lewis.....	do.....	132	22	4.5	162
D. T. Lane.....	do.....	129.6	24.1	4	146.94
Douglas Hall.....	do.....	127.5	27.2	4.3	122
Bill Clark.....	do.....	122	29.6	5	142
Sea Lion.....	do.....	121	20	3	106
John Mackey.....	do.....	120	23.5	3.6	124.16
Jessie.....	do.....	120	20	3.4	68.47
Geo. Matheson.....	do.....	112	22	4	124.06
W. B. Calderwood.....	do.....	112	24.5	4.6	85.55
Mary Stewart.....	do.....	100	20	3.2	91
Nelle England.....	do.....	92	18	3.5	85
Bob Lee.....	do.....				
Bee.....	U. S. towboat.....	120	22	3.6	86
Golden Rod.....	U. S. L. H. tender.....	150	26.5	3.7	143.58
Mascot <sup>a</sup> .....	U. S. launch.....	61	8.1	3.4	7
Billy Martin <sup>a</sup> .....	Pump and harbor.....	89	14.3	4	28.15
Iron Duke <sup>a</sup> .....	do.....	88	13.5	3.7	30.63
Madge <sup>a</sup> .....	Launch.....	68.5	10.5	4	9.90
Nancy E <sup>a</sup> .....	do.....	35	6	4	3
Lucy <sup>a</sup> .....	do.....	28.7	6	3	2
Ruth <sup>a</sup> .....	do.....	25	5	4	2
Amelia <sup>a</sup> .....	do.....	25	5	4	2
Soncy <sup>a</sup> .....	do.....	18	5	3	1
Virgie <sup>a</sup> .....	do.....				
C. Smith <sup>a</sup> .....	do.....				
C. A. Hill <sup>a</sup> .....	do.....				
Osceola <sup>a</sup> .....	do.....				
Humbug <sup>a</sup> .....	do.....				
Ometa <sup>a</sup> .....	do.....				
Sailor Boy <sup>a</sup> .....	do.....				
Swan.....	do.....				
Eulue <sup>a</sup> .....	do.....				
Loon.....	do.....				
Willard.....	do.....				
Katie Paden <sup>a</sup> .....	do.....				
Gordon Nigh.....	do.....				
J. W. Mahan <sup>a</sup> .....	do.....				
Rambler.....	do.....				
Minnehaha <sup>a</sup> .....	do.....				
Will H. Stone <sup>a</sup> .....	do.....				
Lizzie D. <sup>a</sup> .....	do.....				
Sadie E. <sup>a</sup> .....	do.....				

<sup>a</sup>Screw propeller.

Where no dimensions are given the boats are not registered, being small naphtha or gasoline launches.

H H 6.

## IMPROVEMENT OF GAULEY RIVER, WEST VIRGINIA.

By authority of the Chief of Engineers, United States Army, dated July 16, 1902, the balance available for this work was deposited to the credit of the Treasurer of the United States, and the work closed in September, 1902, after transferring the property to the Kanawha River improvement.

*Money statement.*

July 1, 1902, balance unexpended .....		\$261.73
June 30, 1903, amount expended during fiscal year .....	\$22.78	
Amount deposited .....	238.95	
		<hr/> 261.73

## APPROPRIATIONS.

August 11, 1888 .....	\$3,000
September 19, 1890 .....	3,000
July 13, 1892 .....	3,000
August 18, 1894 .....	3,000
June 3, 1896 .....	3,000
Total .....	<hr/> 15,000

## H H 7.

## IMPROVEMENT OF ELK RIVER, WEST VIRGINIA.

This work was closed in September, 1902, after transferring the property belonging thereto to the Kanawha River improvement and depositing the available balance to the credit of the Treasurer of the United States, as authorized by the Chief of Engineers, United States Army, under date of July 30, 1902.

*Money statement.*

July 1, 1902, balance unexpended .....	\$240.88
June 30, 1903, amount deposited during fiscal year .....	240.88

## APPROPRIATIONS.

June 18, 1878 .....	\$5,000	September 19, 1890 .....	\$2,500
June 14, 1880 .....	5,000	July 13, 1892 .....	2,500
March 3, 1881 .....	5,000	August 18, 1894 .....	2,000
August 2, 1882 .....	2,000	June 3, 1896 .....	2,000
August 5, 1886 .....	1,500		
August 11, 1888 .....	3,000	Total .....	<hr/> 30,500



## APPENDIX I I.

IMPROVEMENT OF MUSKINGUM RIVER, OHIO; OF GUYANDOT RIVER, WEST VIRGINIA; OF BIG SANDY RIVER AND ITS FORKS, WEST VIRGINIA AND KENTUCKY, AND OF KENTUCKY RIVER, KENTUCKY.

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REPORT OF LIEUT. COL. E. H. RUFFNER, CORPS OF ENGINEERS,  
OFFICER IN CHARGE, FOR THE FISCAL YEAR ENDING JUNE 30,  
1903, WITH OTHER DOCUMENTS RELATING TO THE WORKS.

### IMPROVEMENTS.

- |   |   |
|---|---|
| 1. Muskingum River, Ohio.               | 5. Operating and care of lock and dam   |
| 2. Operating and care of locks and dams | (No. 8) on Big Sandy River, West        |
| on Muskingum River, Ohio.               | Virginia and Kentucky.                  |
| 3. Guyandot River, West Virginia.       | 6. Kentucky River, Kentucky.            |
| 4. Big Sandy River, West Virginia and   | 7. Operating and care of locks and dams |
| Kentucky.                               | on Kentucky River, Kentucky.            |

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ENGINEER OFFICE, UNITED STATES ARMY,  
*Cincinnati, Ohio, July 15, 1903.*

GENERAL: I have the honor to transmit herewith the annual reports of the works under my charge for the fiscal year ending June 30, 1903.

The reports for the Muskingum River have been prepared by Assistant Engineer Edmund Moeser.

The reports for the Guyandot and Big Sandy rivers have been prepared by Assistant Engineer B. F. Thomas.

The report for operating and care of Kentucky River has been prepared by Assistant Engineer John H. Westerfield.

Very respectfully, your obedient servant,

E. H. RUFFNER,  
*Lieut. Col., Corps of Engineers.*

Brig. Gen. G. L. GILLESPIE,  
*Chief of Engineers, U. S. A.*

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### I I I.

#### IMPROVEMENT OF MUSKINGUM RIVER, OHIO.

A project for the application of the \$10,300 appropriated by the act of June 13, 1902, and the balance unexpended from former appropriations was submitted July 9, 1902. In accordance therewith plans were completed and specifications prepared for building four lock masters' dwellings and raising the crest of Dam No. 9 with concrete, and proposals were invited, resulting in the receipt of four bids for the

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work on dam, which were rejected on account of being excessive. No bids were received for building the lock houses.

At the close of the year modified specifications have been prepared for building the four lock masters' houses and proposals were again invited. Steps have been taken to perform all the work required for raising the crest of Dam No. 9 by hired labor and to procure the necessary material by formal contract.

To complete the project contemplated by the item in the river and harbor act approved June 13, 1902, namely, to provide dwellings for lock masters at sites where there were no houses when the locks and dams were turned over to the United States and to raise the crests of Dams 3 and 9, the additional appropriation of \$8,000 is recommended for building a combined lock masters' house and storehouse at Dam 10, Zanesville, estimated to cost \$5,000, and for raising the crest of Dam 3, at an estimated cost of \$3,000.

Commercial statistics are reported under the head of "Operating and care," etc.

## Money statement.

July 1, 1902, balance unexpended .....	\$11,867.49	
March 13, 1903, received from sale of condemned property .....	192.07	
		11,559.56
February 4, 1903, amount deposited to the credit of the Treasurer of the United States through the assistant treasurer. United States at Cincinnati, Ohio, for credit to the appropriation "Improving harbor at Cleveland, Ohio" .....	\$56.53	
June 30, 1903, amount expended during fiscal year .....	107.90	
		164.43
July 1, 1903, balance unexpended .....	11,395.14	
July 1, 1903, outstanding liabilities .....	52.55	
		11,342.59
Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903 .....	8,000.00	
Submitted in compliance with requirements of sundry civil act of June 4, 1897.		

## APPROPRIATIONS.

August 11, 1888 .....	\$102,000.00
July 1, 1898 .....	6,000.00
June 13, 1902 .....	10,300.00
Received from sale of property .....	192.07
Total .....	118,492.07

## I I 2.

### OPERATING AND CARE OF LOCKS AND DAMS ON MUSKINGUM RIVER, OHIO.

This river has 10 locks with fixed dams, which, with their appurtenances, are maintained under the indefinite appropriation for operating and care of canals and other works of navigation.

During the past year the system has been operated and kept in repair and four of the lateral canals, aggregating  $2\frac{1}{2}$  miles in length,



have been maintained in navigable condition. The canal at Taylorsville, which is not now required for navigation, has been kept open to furnish water power.

Through navigation was interrupted forty-seven days by ice and eight days by high water. The canal at No. 7 was closed for a period of thirty-two days on account of repairs made to the abutments and gates at its head. There was no suspension of navigation on account of accident.

The following is a summary of the work, in addition to ordinary maneuvering of the locks and care of property, which was done at the different parts of the system during the year:

*At Lock No. 1, Marietta.*—Reconstructed the lower gates of lock above the ordinary low-water surface; replaced broken parts of the turbine machinery on lock walls; repainted the wood and metal work of the lockmasters' house, and kept the grounds in presentable condition.

*At Lock No. 2, Devols.*—Reconstructed the four leaves of the upper and lower gates of lock; rebuilt two guide cribs below the lock; repaired the lower apron of dam for 90 feet of its length, and renewed backing of dam where necessary.

*At Lock No. 3, Lowell.*—Renewed eight of the decayed arms and the sheathing of the lower gates of lock; completed the renovation of the dam by reconstructing the upper part for 294 feet of its length, replacing 55 feet in length of the second step and 60 feet in length of the lower apron; refilled eroded places in the canal embankment, and replaced broken parts of the lock machinery; replaced six of the guide piling below lock.

*At Lock No. 4, Beverly.*—Rebuilt both leaves of the lower gates of lock; renewed some of the decayed timbers in upper gates and two-thirds of the arms in guard gates at head of canal. Replaced some of the slope wall on embankment at right end of dam and placed a stone covering over a part of the embankment at left end of dam. Rebuilt two and repaired one of the head gates of the conduit under terreplein of lock. Refastened loose sheeting on the lower apron of the dam.

*At Lock No. 5, Luke chute.*—Nothing was required except some repairs to machinery for operating lock gates, new gate fenders, and the removal of drift and sedimentary deposits from the lock.

*At Lock No. 6, Stockport.*—Nothing was done except clearing obstructions from lock and repainting the lock-house and waiting room.

*At Lock No. 7, McConnellsville.*—Under contract with E. J. Landor, approved October 17, 1902, the abutments and miter sill for guard gates at head of canal were repaired by filling tight material under the timbers upon which the works are founded; placing sheet piling across the head; replacing with concrete the wooden floor, miter sill, coping of abutments, and the two guide walls below abutments; replacing with concrete the masonry faces of abutments and refilling the earth embankment back of the left abutment. Under the same contract repairs were made to the dam. They consisted in replacing the old wooden steps of dam with a concrete slope for 110 feet of its length. At the close of the fiscal year 44 per cent of the contemplated repairs to dam have been completed.

Labor was employed to replace a wooden floor in the storehouse with 1,564 square feet of concrete, to handle materials in storehouses, to make minor repairs to lock gates and machinery in carpenter shop, and to plane all timbers needed for repair of lock gates and floating plant.

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*At Lock No. 8, Eagleport.*—Rebuilt both leaves of the lower gates of lock and prepared the timbers required for repair of upper gates.

*At Lock No. 9, Taylorsville.*—Reconstructed the lower apron of dam for a length of 324 feet and the second step for 170 feet. Refilled a section of the canal embankment at old lock with 655 cubic yards earth and made minor repairs to the lower gates of lock.

*At Lock No. 10, Zanesville.*—Repaired the irons on lock gates, repainted the storehouse, and kept the canal embankments in good condition.

The floating plant, consisting of dredge, steamboat, scows, pile-driver, barges, etc., was kept in serviceable condition; extensive repairs were made to the dredge, dump scows, and one barge.

The U. S. dredge *Malta* was usefully employed throughout the working season in dredging out the canals, approaches to locks, and channels in pools, and in removing snags and other obstructions. The dredge was attended by the U. S. steamer *Vega*.

The following is a statement of the amounts and dates of all allotments for this work:

Appropriated—		Allotted—	
August 5, 1886 .....	\$20,000.00	July 22, 1893 .....	\$52,745.36
Allotted—		July 25, 1894 .....	47,157.66
July 21, 1887 .....	190,000.00	July 12, 1895 .....	29,971.20
August 13, 1888 .....	177,623.00	July 24, 1896 .....	41,337.10
July 1, 1889 .....	232,080.00	July 23, 1897 .....	43,527.50
July 19, 1890 .....	195,665.00	July 23, 1898 .....	35,950.58
May 28, 1891 .....	20,000.00	July 25, 1899 .....	44,954.30
July 8, 1891 .....	155,200.00	October 16, 1899 .....	1,500.00
November 9, 1891 .....	39,980.00	July 14, 1900 .....	44,921.96
November 24, 1891 .....	1,200.00	June 25, 1901 .....	38,251.42
December 9, 1891 .....	1,200.00	July 2, 1902 .....	47,576.72
January 5, 1892 .....	12,241.54		
August 3, 1892 .....	42,919.47	Total .....	1,516,002.81

## SPECIAL WORK AUTHORIZED BY ACT OF CONGRESS.

Allotted—	
March 21, 1895, protection wall at Zanesville .....	\$1,651.00
June 17, 1895, pier of railroad bridge at Marietta .....	10,449.60
June 17, 1895, pier of county bridge at Taylorsville .....	5,834.20
Total .....	17,934.80

## ABSTRACT OF CONTRACTS IN FORCE ON MUSKINGUM RIVER DURING THE FISCAL YEAR ENDING JUNE 30, 1903.

*Contract for furnishing lock-gate timber for use on the Muskingum River, Ohio.*

Name of contractor: Winfield S. Gregg.

Date of approval: March 27, 1902.

Date of beginning and date of expiration: 6,010 feet B. M. for Lock No. 9 must be delivered on or before May 13, 1902; the remainder on or before July 8, 1902.

Items.	Contract price (unit rate) per M feet.
16,218 feet B. M. timber, delivered f. o. b. cars or boat at Marietta, Ohio. ....	\$43.50
16,434 feet B. M. timber, delivered f. o. b. cars or boat at Malta or Zanesville, Ohio. ....	34.50

Completed.

*Contract for furnishing rubblestone for repairs on Muskingum River, Ohio.*

Name of contractor: J. W. Leake.

Date of approval: September 19, 1902.

Date of beginning and date of expiration: Delivery to be completed on or before November 28, 1902.

Item.	Contract price per cubic yard.
1,000 cubic yards rubblestone .....	\$0.87

Completed.

*Contract for furnishing drift bolts for repairs on Muskingum River, Ohio.*

Name of contractor: New Jersey Foundry and Machine Company.

Date of approval: September 19, 1902.

Date of beginning and date of expiration: Delivery to be made on or before October 24, 1902.

Items.	Contract price per pound.
1,800 drift bolts, $\frac{1}{2}$ -inch square, 15 inches long, with heads .....	\$0.0285
1,400 drift bolts, $\frac{1}{2}$ -inch square, 23 inches long, with heads .....	
600 drift bolts, $\frac{1}{2}$ -inch square, 23 inches long, without heads .....	

Completed.

*Contract for furnishing timber for repairs on the Muskingum River, Ohio.*

Name of contractor: Milton Fouts.

Date of approval: September 23, 1902.

Date of beginning and date of expiration: At least 20,000 feet B. M. of lot 2 must be delivered by October 19, 1902; the remainder not later than December 29, 1902; lot 1 not later than November 29, 1902.

Items.	Contract price (unit rate).
Lot 1: 19,448 feet B. M. delivered f. o. b. cars or boat at Marietta, Malta, or Zanesville, Ohio .....	M feet B. M. \$26.50
Lot 2: 121,000 feet B. M. delivered on the Muskingum River bank, convenient for loading on barges, at any point between Marietta and Zanesville, Ohio .....	16.17

Completed.

*Contract for reconstruction of abutments and miter sill for guard gates at head of canal at Lock No. 7 and the repair of about 240 feet in length of Dam No. 7, Muskingum River, Ohio.*

Name of contractor: E. J. Landor.

Date of approval: October 17, 1902.

Date of beginning: November 11, 1902.

Date of expiration: By December 1, or, in case of unusual season, before July 1, 1903. (See paragraph 61 for details.)

Items.	Contract price (unit rate).
Repair of abutments and miter sill at McConnelsville, Ohio:	
Excavation .....	cubic yard.. \$1.00
Earth filling .....	do.. 2.00
Timber .....	M feet B. M.. 20.00
Concrete .....	cubic yard.. 8.00
Repairs to Dam No. 7, Muskingum River, Ohio:	
Excavation .....	cubic yard.. .50
Stone filling .....	do.. .60
Timber .....	M feet B. M.. 10.00
Concrete .....	cubic yard.. 5.00

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*Contract for furnishing one locomotive-type steam boiler for U. S. dredge Malta, Muskingum River, Ohio.*

Name of contractor: The Union Machine Company.

Date of approval: March 24, 1903.

Date of beginning: April 7, 1903.

Date of expiration: Within eighty working days after April 7, 1903.

Item.	Contract price.
One locomotive-type fire-box steam boiler.....	\$748

*Summary of expenditures for operating and care of locks and dams on Muskingum River, Ohio, for the fiscal year ending June 30, 1903.*

Office expenses, superintendence, and contingencies.....	\$5,465.00
Labor.....	21,048.28
Fuel.....	717.96
Expenses.....	1,118.84
Repairs.....	15,103.81
Total.....	43,448.89

*Detailed statement and cost of dredging on Muskingum River under the appropriation for operating and care of canals and other works of navigation, indefinite, for the fiscal year ending June 30, 1903.*

Date.	Locality.	Material excavated.	Total cost.
July.....	Lowell, Ohio.....	800 yards mud, at 7½ cents.....	\$61.00
		Repairs.....	400.38
August.....	Eagleport.....	5,500 yards mud and sand, at 6 cents.....	330.00
	do.....	6 piling, at \$2.50.....	15.00
	do.....	2 snags, at \$3.61½.....	7.23
	McConnelsville, Ohio.....	200 yards stone, at 20 cents.....	40.00
	do.....	2,200 yards mud and sand, at 6 cents.....	132.00
	do.....	4 piling, at \$2.50.....	10.00
September.....	Marietta, Ohio.....	3,340 yards mud and sand, at 4 cents.....	133.60
	do.....	10 large stone, per lot.....	15.00
	do.....	8 logs, per lot.....	9.22
	Devols, Ohio.....	3 snags, per lot.....	7.00
	do.....	3,000 yards mud, at 4½ cents.....	135.00
	Lowell, Ohio.....	4,800 yards mud, at 3½ cents.....	168.00
	Beverly, Ohio.....	800 yards mud, at 4½ cents.....	36.00
	Luke Chute, Ohio.....	280 yards mud, at 4 cents.....	11.20
October.....	Lowell, Ohio.....	4,570 yards mud, at 3½ cents.....	159.95
	Beverly, Ohio.....	6,240 yards mud, at 4½ cents.....	280.80
	McConnelsville, Ohio.....	1,350 yards sand and gravel, at 4 cents.....	54.00
	Eagleport, Ohio.....	2 snags, at \$3.....	6.00
	do.....	12 pieces timber, per lot.....	7.96
	do.....	22 large stones, per lot.....	22.00
	do.....	1,900 yards sand and gravel, at 4½ cents.....	85.50
	do.....	2 snags, per lot.....	5.00
November.....	McConnelsville, Ohio.....	1,500 yards mud, at 14 cents.....	210.00
	Eagleport, Ohio.....	3,130 yards sand and gravel, at 7½ cents.....	234.75
	do.....	21 logs, per lot.....	42.00
	do.....	1 snag.....	6.39
December.....	McConnelsville, Ohio.....	Removed cofferdam, per lot.....	150.00
	do.....	Removed 4,000 feet timber, per lot.....	40.00
	do.....	840 yards sand and gravel, at 10 cents.....	84.00
	do.....	Drove 3 piling, at \$5.....	15.00
	Eagleport, Ohio.....	Drove 5 piling, at .5.....	25.00
December to May, 1903.....		Repairs.....	1,638.82
May.....	Eagleport, Ohio.....	1,500 yards sand and gravel, at 4½ cents.....	67.50
	do.....	14 logs, per lot.....	8.26
	McConnelsville, Ohio.....	2,800 yards mud, at 3½ cents.....	98.00
	Lowell, Ohio.....	7,200 yards mud, at 3½ cents.....	252.00
June.....	Devols, Ohio.....	3,800 yards sand, at 4½ cents.....	161.50
	do.....	2 snags, per lot.....	11.73
	Marietta, Ohio.....	14,340 yards mud and sand, at 5 cents.....	717.00
	do.....	26 logs, per lot.....	14.00
Total.....			5,907.79

The sum of \$4,000 for operating U. S. S. *Tega* during the year is not included in the total cost of dredging, but the greater part of that amount was incurred while engaged as tender for U. S. dredge *Malta*.

*Muskingum River leases.*

Location.	Lessee.	Dated.	Expires.
<i>Year ending April 30, 1903.</i>			
Dam No. 1, Marietta	Phoenix Mill Co	May 1, 1873	May 1, 1903
Dam No. 2, Devols	Gates & Payne	May 1, 1889	May 1, 1909
Dam No. 3, Lowell	F. Wilking & Co.	May 1, 1890	May 1, 1910
Do	Rechsteiner Bros.	do	Do.
Do	do	Nov. 1, 1892	Nov. 1, 1912
Do	E. W. Sprague	Dec. 2, 1879	Dec. 15, 1909
Do	First National Bank	June 1, 1900	Do.
Do	E. W. Webster	do	June 1, 1906
Dam No. 4, Beverly	Robbins Bros	May 1, 1889	May 1, 1909
Do	Langenberg & Abrams	May 1, 1890	May 1, 1910
Do	T. F. Lowe	do	Do.
Do	Village of Beverly	May 1, 1901	May 1, 1921
Dam No. 6, Stockport	W. H. Phillips	May 1, 1889	May 1, 1909
Dam No. 7, McConnellsville	E. M. Stanbery	Sept. 1899	Do.
Do	McConnellsville-Malta Electric Co.	Nov. 1, 1890	Nov. 1, 1920
Do	Ohio and Little Kanawha Railroad Co	May 1, 1900	May 1, 1925
Dam No. 9, Duncans Falls	John Miller	Dec. 31, 1896	Do.
Do	Frazier & Son	do	Do.
Dam No. 10, Zanesville	John T. Drone	May 1, 1890	May 1, 1910
Do	W. J. & C. C. Atwell and T. F. Spangler.	do	Do.
Do	do	May 1, 1889	May 1, 1909
Do	Muskingum Coffin Co.	May 1, 1890	May 1, 1910
Do	Zanesville Mantel and Furniture Co.	do	Do.
Do	T. L. Moorehead	May 1, 1893	May 1, 1913
Do	Muskingum and Ohio River Transportation Co., Incorporated.	Nov. 13, 1897	Nov. 13, 1902
Symmes Creek	Jasper K. McCann	May 1, 1900	May 1, 1906
<i>Year ending May 31, 1903.</i>			
Dam No. 10, Zanesville	John Blankenbuhler	June 1, 1892	June 1, 1909
Do	Frederick Abel Estate	do	Do.

*Leases—Water power, land, and rental.*

Lessee.	Subject.	Cubic feet of water per minute.	Annual rental.	Rebate.	Rents collected.
Phoenix Mill Co	Water power	3,000	\$350.00	\$79.55	\$270.45
Gates & Payne	do	9,000	108.00		108.00
F. Wilking & Co. <sup>a</sup>	do	7,280	174.72		174.72
Rechsteiner Bros.	do	4,446	106.70		106.70
Do	Land		10.00		10.00
E. W. Sprague	do		5.00		5.00
First National Bank	do		10.00		10.00
E. W. Webster	do		5.00		5.00
Robbins Bros. <sup>b</sup>	Water power	1,904	100.00		
Langenberg & Abrams	do	5,600	114.24		114.24
T. F. Lowe	do	6,033	109.80		109.80
Village of Beverly	do	5,000	100.00		100.00
W. H. Phillips	do	6,390	230.04		230.04
E. M. Stanbery <sup>c</sup>	do	( <sup>d</sup> )			
McConnellsville-Malta Electric Co.	do	8,702	208.84		208.84
Ohio and Little Kanawha R. R. Co.	Land		2.50		2.50
John Miller <sup>e</sup>	Water power	( <sup>e</sup> )			
Frazier & Son <sup>e</sup>	do	( <sup>e</sup> )			
John T. Drone	do	7,590	453.60		453.60
W. J. & C. C. Atwell and T. F. Spangler <sup>f</sup>	do	6,029	361.74		361.74
Do. <sup>f</sup>	do	7,399	443.82		443.82
Muskingum Coffin Co.	do	4,619	207.86		207.86
Zanesville Mantel and Furniture Co.	do	4,794	186.96		186.96
T. L. Moorehead	Land		25.00		25.00
Muskingum and Ohio River Transportation Co., Incorporated. <sup>g</sup>	do		25.00		25.00
Jasper K. McCann	do		5.00		5.00
John Blankenbuhler	Water power	2,700	100.00		100.00
Frederick Abel Estate	do	5,200	184.50		184.50
Total					3,448.77

<sup>a</sup> Lease transferred to John A. McClain, December 31, 1902.<sup>b</sup> No collection.<sup>c</sup> Perpetual free lease of water power.<sup>d</sup> Enough to propel 10 run of 4 foot 5 inch millstones.<sup>e</sup> Enough to propel 15 run of 4 foot millstones.<sup>f</sup> Leases transferred to the Zanesville Railway, Light and Power Company, December 29, 1902.<sup>g</sup> Lease issued under date of March 23, 1903, for a term of five years, commencing November 14, 1902.

NOTE.—Lease issued to the Zanesville Railway, Light and Power Company for a term of twenty years, commencing July 1, 1903. Date of lease April 30, 1903.

# 1738 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

## COMMERCIAL STATISTICS.

*Commerce of Muskingum River during the calendar year ending December 31, 1902.*

### LOCK NO. 1.

Month.	Steam-boats.	Barges.	Miscellaneous.	Total.	Number of lock-ages.
March .....	15	1	3	19	19
April .....	73	4	30	116	116
May .....	75	8	8	91	91
June .....	85	19	2	106	106
July .....	94	17	5	116	116
August .....	75	4	15	94	94
September .....	68	4	3	75	75
October .....	63	5	5	73	73
November .....	50	3	5	58	58
December .....	65	5	5	75	75
Total .....	668	70	90	828	828

### LOCK NO. 2.

March .....	47	7	2	56	56
April .....	64	6	4	74	74
May .....	73	7	4	84	84
June .....	67	8	12	87	87
July .....	64	8	10	77	77
August .....	65	4	7	76	76
September .....	62	5	12	79	79
October .....	72	8	8	88	88
November .....	48	3	3	54	54
December .....	55	2	4	61	61
Total .....	617	53	66	736	736

### LOCK NO. 3.

March .....	49	7	2	58	58
April .....	65	6	5	76	76
May .....	82	8	3	93	93
June .....	69	8	9	86	86
July .....	66	4	12	82	82
August .....	70	4	8	82	82
September .....	62	4	10	76	76
October .....	73	7	8	87	87
November .....	50	6	4	60	60
December .....	55	2	6	63	63
Total .....	640	56	67	763	763

### LOCK NO. 4.

March .....	50	5	4	59	59
April .....	65	4	8	77	77
May .....	68	7	4	79	79
June .....	77	10	13	100	100
July .....	65	8	12	85	85
August .....	67	5	13	85	85
September .....	60	9	8	77	77
October .....	79	12	6	97	97
November .....	51	7	4	62	62
December .....	54	3	5	62	62
Total .....	666	65	72	773	773

### LOCK NO. 5.

March .....	12	1	-----	13	13
April .....	11	-----	2	13	13
May .....	20	4	7	31	31
June .....	28	7	8	43	43
July .....	20	5	4	29	29
August .....	21	4	7	32	32
September .....	16	9	7	32	32
October .....	24	12	8	44	44
November .....	15	9	3	27	27
December .....	13	2	3	18	18
Total .....	180	53	49	282	282

# APPENDIX I I—REPORT OF LIEUT. COL. RUFFNER. 1739

Commerce of Muskingum River during the calendar year ending December 31, 1902—  
Continued.

## LOCK NO. 6.

Month.	Steam-boats.	Barges.	Miscellaneous.	Total.	Number of lock-ages.
March.....	12	1	-----	13	13
April.....	11	-----	2	13	13
May.....	20	4	7	31	31
June.....	28	7	9	44	44
July.....	18	6	7	31	31
August.....	21	8	7	31	31
September.....	16	7	9	32	32
October.....	20	12	8	40	40
November.....	11	7	3	21	21
December.....	13	3	3	19	19
Total.....	170	50	55	275	275

## LOCK NO. 7.

March.....	8	-----	-----	8	8
April.....	13	-----	-----	13	13
May.....	20	4	4	28	28
June.....	28	8	5	41	41
July.....	18	9	-----	27	27
August.....	24	8	6	38	38
September.....	19	14	4	37	37
October.....	22	10	6	38	38
December.....	12	5	5	22	22
Total.....	164	58	30	252	252

## LOCK NO. 8.

March.....	55	1	-----	56	56
April.....	62	-----	-----	62	62
May.....	71	6	-----	77	77
June.....	77	9	5	91	91
July.....	86	9	5	100	100
August.....	75	5	5	85	85
September.....	70	8	5	83	83
October.....	66	7	4	77	77
November.....	47	4	2	53	53
December.....	53	9	5	68	68
Total.....	661	56	31	750	750

## LOCK NO. 9.

March.....	54	-----	-----	54	54
April.....	63	-----	1	64	64
May.....	72	8	6	81	81
June.....	79	10	6	95	95
July.....	86	7	7	100	100
August.....	75	4	5	84	84
September.....	72	7	6	85	85
October.....	62	5	7	74	74
November.....	47	4	4	55	55
December.....	52	9	4	65	65
Total.....	662	49	46	757	757

## LOCK NO. 10.

March.....	55	2	-----	57	57
April.....	62	3	2	67	67
May.....	71	3	-----	74	74
June.....	80	11	5	96	96
July.....	84	15	-----	99	99
August.....	69	2	5	76	76
September.....	70	4	6	80	80
October.....	62	4	5	71	71
November.....	47	4	5	56	56
December.....	49	9	5	63	63
Total.....	649	57	33	739	739

# 1740 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

Commerce of Muskingum River during the calendar year ending December 31, 1902—  
Continued.

## SUMMARY.

Lock No.	Steam-boats.	Barges.	Miscellaneous.	Total.	Number of lockages.
1.....	663	70	90	823	823
2.....	617	53	66	736	736
3.....	640	56	67	763	763
4.....	636	65	72	773	773
5.....	180	53	49	282	282
6.....	170	50	55	275	275
7.....	164	58	30	252	252
8.....	661	58	31	750	750
9.....	662	49	46	757	757
10.....	649	57	38	744	744
Total.....	5,042	569	539	6,150	6,150

Statement of commerce passing the locks on the Muskingum River, Ohio, during the calendar year ending December 31, 1902.

Articles.	Lock No.—									
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
Beer.....tons..	11	27	27	18	7	8	9	10	10	11
Brick.....do.....	384	454	480	247	75	75	318	1,699	1,718	1,742
Cattle.....do.....	392	449	471	384	234	194	280	129	81	72
Coal.....do.....	4,495	1,299	1,495	1,317	1,354	679	446	302	899	479
Cement.....do.....	52	114	93	90	48	53	89	68	83	73
Corn.....do.....	413	530	606	408	204	133	100	91	86	118
Eggs.....do.....	696	606	570	464	340	204	282	84	54	55
Flour.....do.....	380	536	540	403	144	247	150	168	170	216
Hay.....do.....	1,400	1,918	1,789	1,413	966	1,066	780	620	328	311
Hides.....do.....	15	20	23	20	31	9	13	26	16	8
Hogs.....do.....	371	433	465	352	146	255	115	84	110	60
Horses.....do.....	297	285	289	271	180	176	162	150	84	181
Iron, manufac- tured.....tons..	1,508	1,558	1,475	1,294	1,235	1,039	956	1,000	1,019	1,040
Leather.....do.....	17	13	13	11	61	9	10	20	8	16
Lime.....do.....	55	48	47	52	17	46	53	45	66	152
Lumber.....do.....	2,827	580	639	724	496	714	568	1,285	1,626	1,466
Merchandise, mis- cellaneous.....tons..	16,766	16,632	16,061	14,201	7,741	7,385	6,770	15,676	18,265	21,311
Oil.....do.....	70	83	82	73	85	38	27	43	58	59
Poultry.....do.....	199	204	187	158	184	92	113	57	50	50
Produce.....do.....	64	217	165	38	13	19	23	46	28	43
Salt.....do.....	182	275	264	175	113	115	136	187	346	354
Sand, stone, etc., tons.....	1,325	1,635	1,570	863	677	735	1,135	630	231	900
Sheep.....tons..	131	176	181	121	76	63	43	57	54	23
Staves.....do.....	450	471	455	452	375	300	23	10	89	20
Stoneware.....do.....	330	333	331	316	317	316	300	417	336	402
Straw.....do.....	539	719	719	531	396	341	289	451	431	547
Sugar.....do.....	31	43	38	33	20	19	23	69	68	38
Timber.....do.....	2,531	342	474	642	.....	.....	23	71	55	244
Wheat.....do.....	435	504	530	550	476	588	400	166	189	26
Wool.....do.....	3	3	3	2	2	2	1	1	1	3
Total.....	36,342	30,464	30,007	25,681	15,753	14,945	13,552	24,151	26,539	30,758
Passengers.....	26,465	25,379	22,486	14,320	4,515	4,719	4,846	23,680	33,959	50,207

List of steamboats (stern-wheel) plying on the Muskingum River between  
Zanesville and Marietta, Ohio.

Name of steamer.	Length.	Breadth.	Depth.	Draft.	Ton- nage.
	Feet.	Feet.	Feet.	Inches.	
Lorena.....	141	32	5	24	237
Sonoma.....	125	20	34	23	116
Hazel Rice.....	126	224	4	23	138
Zanetta <sup>a</sup> .....	150	35	6	33	165

<sup>a</sup> Side-wheel.



# APPENDIX I. I—REPORT OF LIEUT. COL. RUFFNER. 1741

*List of steamboats (stern-wheel) plying on the Muskingum River between Zanesville and Marietta, Ohio—Continued.*

Name of steamer.	Length.	Breadth.	Depth.	Draft.	Ton- nage.
	<i>Feet.</i>	<i>Feet.</i>	<i>Feet.</i>	<i>Inches.</i>	
Valley Gem.....	125	26½	4	24	155
Vega.....	104	17½	4	26	90
Del Norte.....	35½	8½	4½	40	5
Excel.....	110	18	3	24	100
Darling.....	120	24	4½	42	100
Helen White.....	170	32	5	24	300
T. N. Bardsdall.....	130	22	4	24	150
Katie.....	90	20	3	24	50
Mary Stewart.....	100	19	3	20	90
Robert P. Gilham.....	165	34	5	36	275
Nellie Bartlett.....	100	18	4	24	60
Mary H. ....	120	22	3	18	100
James Y. Lockwood.....	180	35	6	34	300
Jewel.....	110	22	4	24	120
D. T. Watson.....	100	20	4	24	100
S. B. Goucher.....	120	24	4½	42	100
National.....	170	34	5	36	300
Miles H. ....	110	17	3½	18	90
F. A. Gable.....	120	18	3	24	100
Clifton.....	125	30	4½	36	125

\* Only occasional trips.

## I I 3.

### IMPROVEMENT OF GUYANDOT RIVER, WEST VIRGINIA.

For description see Annual Report of the Chief of Engineers for 1875, pages 747-755; 1895, pages 2517-2520; 1896, pages 2324, 2325.

Nothing has been done toward its improvement since 1899, when the removal of channel obstructions was, to a certain extent, completed. Owing to the construction of a railroad into that region, very little steamboating has been done of late years, the principal commerce being timber. The tonnage is estimated at 160,000 tons for the past year.

#### Money statement.

July 1, 1902, balance unexpended.....	\$0.22
June 30, 1903, amount expended during fiscal year .....	.22

#### APPROPRIATIONS.

June 18, 1878.....	\$2,000	September 19, 1890.....	\$2,000
March 3, 1879.....	1,000	July 13, 1892.....	2,000
June 14, 1880.....	2,000	August 18, 1894.....	2,000
March 3, 1881.....	3,500	June 3, 1896.....	1,000
August 2, 1883.....	2,000	March 3, 1899.....	1,000
July 5, 1884.....	2,000		
August 11, 1888.....	2,000	Total.....	22,500

#### COMMERCIAL STATISTICS.

\* \* \* \* \*

#### List of boats plying the Guyandot River, West Virginia.

Name of boat.	Character.	Length.	Breadth.	Depth.	Ton- nage.
		<i>Feet.</i>	<i>Feet.</i>	<i>Feet.</i>	
Guyandot.....	Side-wheel.....	104	16	2.8	43.88
Sadie E.....	do.....	50	9	2.4	9

## I 14.

## IMPROVEMENT OF BIG SANDY RIVER AND LEVISA AND TUG FORKS, WEST VIRGINIA AND KENTUCKY.

## (a) BIG SANDY RIVER.

A statement of the original condition, projects, etc., will be found in the summary.

The United States has built one lock (and movable dam) on this river, which is completed and in operation, and is located at Louisa, Ky. The present project provides for 21 more, extending slack water from the mouth of the Big Sandy River up the forks to Pikeville on the Levisa and the mouth of Pond Creek on Tug Fork.

Of the locks provided for in the project, those in the Big Sandy itself are well advanced toward completion, and authority for the construction of one on each of the forks above Louisa was given in the last river and harbor act, and their locations have been decided upon at Saltpeter branch on Tug and at Chapman Station on Levisa, but the land necessary for sites has not yet been acquired. The preliminaries to this, however, are now under way.

Under the allotment for preliminary work and subsequent appropriations the following work has been accomplished:

*At Lock and Dam No. 1, Callettsbury, Ky.*—Good progress was made on this work, the lock being completed ready to receive the gates before the close of the working season. Since then the upper gates have been put in and the lower ones nearly completed, the embankment behind land wall well advanced, and other necessary work performed. The close of the year finds the lock nearing completion, there being but a few minor matters unfinished.

Work on the dam (which includes an abutment and protection) was begun in April, and has been vigorously prosecuted since, with fair progress, the abutment coffer being completed and its excavation well under way.

The items of work done between July 1, 1902, and June 30, 1903, by Folz & Jonte, contractors, on the lock are as below:

Classification.	Quantities.	Price.	Amount.
Piling (round).....linear feet.....	414	\$0.45	\$186.30
Cofferdam timber.....M feet B. M.....	10,463	39.00	408.06
Timber in permanent work.....do.....	31,000	39.00	1,209.00
Stone masonry.....cubic yards.....	618	90.00	624.00
Paving.....square yards.....	20	2.00	40.00
Riprap.....cubic yards.....	557	2.00	1,114.00
Concrete.....do.....	6,906	4.50	31,077.00
Earth excavation.....do.....	10,175	1.60	6,105.00
Loose-rock excavation.....do.....	653	1.00	653.00
Solid-rock excavation.....do.....	173	1.00	173.00
Deposit.....do.....	1,389	.20	277.80
Embankment.....do.....	4,952	.25	1,238.00
Puddling.....do.....	2834	3.00	790.00
Structural steel.....pounds.....	19,374	.05	968.70
Cast iron.....do.....	8,696	.05	434.80
Total.....			45,298.66

APPENDIX I I—REPORT OF LIEUT. COL. RUFFNER. 1743

The items of work done during the fiscal year by Sheridan-Kirk Contract Company, contractors, on the dam are as below:

Classification.	Quantities.	Price.	Amount.
Piling (round).....linear feet..	384	\$0.50	\$192.00
Cofferdam timber.....M feet B. M..	68,579	40.00	2,743.16
Earth excavation.....cubic yards..	2,900	.42	1,688.00
Total.....			4,578.16

The building used as an office was seriously damaged by fire early in the winter and has been repaired.

*At Lock No. 2, Kavanaugh, Ky.*—The following work has been done by the Evansville Contract Company during the fiscal year:

Classification.	Quantities.	Price.	Amount.
Piling (round).....linear feet..	16	\$0.50	\$8.00
Cofferdam timber.....M feet B. M..	34,550	80.00	2,073.00
Stone masonry.....cubic yards..	84	50.00	410.00
Riprap.....do.....	377	3.00	1,131.00
Concrete.....do.....	7,880	4.00	31,520.00
Earth excavation.....do.....	10,408	.50	5,204.00
Solid rock excavation.....do.....	20	1.00	20.00
Deposit.....do.....	880	.20	176.00
Embankment.....do.....	2,008	.25	502.00
Puddling.....do.....	148	3.00	444.00
Cofferdam filling.....do.....	177	1.00	177.00
Structural steel.....pounds..	1,300	.034	45.50
Cast iron.....do.....	2,280	.034	79.80
Total.....			41,790.80

Progress on this work has not been good and the lock will not be finished till the season is too far advanced to permit the building of the dam, the concrete work not yet having been sufficiently advanced to begin the erection of the gates or completion of valves.

Under the contract approved March 28, 1901, for purchasing Portland cement (Lehigh brand), the following amounts were supplied in the past fiscal year: 400 barrels at Lock No. 1 and 3,400 barrels at Lock No. 2, completing the deliveries covered in this contract.

Under verbal agreements for purchasing Portland cement, the following amounts were delivered during the past fiscal year: 2,400 barrels of Lehigh brand and 3,150 barrels of Universal brand to Lock No. 1, and 2,100 barrels of Lehigh brand and 4,400 barrels of Universal brand to Lock No. 2.

Under the contract approved May 25, 1903, for purchasing Portland cement (Atlas brand) for use at Dam No. 1, 800 barrels have been delivered.

The object of the improvement of the river is to bring to market the coal fields which are tributary to the Big Sandy River and its forks.

Congress has authorized the expenditure of a large sum of money in the execution of the project below Louisa and beginning work in the two forks above. No adequate results can be expected from the series of dams below Louisa until some of the dams are built in the forks. The result of the completion of the entire project can undoubtedly be foretold with accuracy by the time four dams above Louisa on each of the forks have been completed. It will then be known whether the coal deposits tributary to the river will seek that outlet to market in sufficient volume to justify a continuation of the improvement. It

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is estimated that these four dams will cost on Tug Fork \$1,015,000 and on Levisa Fork \$1,090,000.

For reasons given in the final report on survey dated November 26, 1900, regulating works, reaching from the lower lock to the Ohio River, will be required. Their cost is estimated at \$40,000.

## (b) LEVISA AND TUG FORKS.

A statement of the original condition of Levisa and Tug forks will be found in the Annual Report of the Chief of Engineers for 1901, pages 493, 494.

The following work was done on Levisa Fork:

The snag boats traveled a distance of about 122 miles, upstream and back, removing 280 snags, 82 overhanging trees, 31 stumps, 770 cubic yards of loose rock, and 80 cubic yards of solid rock.

The following work was done on Tug Fork:

The snag boats traveled a distance of about 115 miles, upstream and back, removing 237 snags, 88 overhanging trees, 11 stumps, 18 cubic yards of loose rock, and 20 cubic yards of solid rock.

This work resulted in keeping the channel open to navigation between Louisa and Pikeville on Levisa, and Louisa and Williamson on Tug.

An appropriation of \$1,500 for each fork will be sufficient to maintain present works and channels.

## Money statement.

July 1, 1902, balance unexpended.....	\$493,765.62
Amount received from sales.....	1,054.00
Amount appropriated by sundry civil act approved March 3, 1903...	50,000.00
	<hr/> 544,819.62
June 30, 1903, amount expended during fiscal year .....	124,071.15
	<hr/>
July 1, 1903, balance unexpended.....	420,748.47
July 1, 1903, outstanding liabilities .....	1,925.08
	<hr/>
July 1, 1903, balance available.....	418,823.39
	<hr/>
July 1, 1903, amount covered by uncompleted contracts .....	180,382.54
	<hr/>
Amount (estimated) required for completion of existing project...	4,065,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903:	
For works of improvement.....	\$165,000.00
For maintenance of improvement.....	3,000.00
	<hr/> 168,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

## APPROPRIATIONS.

July 18, 1878.....	\$12,000.00	June 6, 1900 .....	\$280,000.00
March 3, 1879.....	12,000.00	June 6, 1900 (allotted) ...	2,000.00
June 14, 1880 .....	55,000.00	March 3, 1901 .....	140,000.00
March 3, 1881 .....	50,000.00	June 13, 1902 .....	178,000.00
August 2, 1882 .....	25,000.00	March 3, 1903.....	50,000.00
July 5, 1884 .....	50,000.00		<hr/>
August 5, 1886 .....	30,000.00	Total.....	1,137,000.00
August 11, 1888 .....	31,500.00	Amount received from	
September 19, 1890.....	36,000.00	other sources in this and	
July 13, 1892 .....	55,000.00	previous years .....	1,704.88
August 18, 1894 .....	45,000.00		<hr/>
June 3, 1896 .....	33,000.00	Total.....	1,138,704.88
March 3, 1899.....	52,500.00		

# APPENDIX I I—REPORT OF LIEUT. COL. RUFFNER. 1745

## ABSTRACT OF CONTRACTS IN FORCE ON BIG SANDY RIVER DURING THE FISCAL YEAR ENDING JUNE 30, 1903.

### *Contract for constructing Lock No. 1, Big Sandy River, West Virginia and Kentucky.*

Name of contractor: Folz & Jonte.

Date of approval: November 8, 1900.

Date of beginning: On or before November 6, 1900.

Date of expiration: August 7, 1902. Extended to February 3, 1903, by supplementary contract dated June 14, 1902. Further extended to September 1, 1903, by supplementary contract dated January 29, 1903.

Items.	Contract price (unit rate).	Items.	Contract price (unit rate).
Piling (round).....linear foot.....	\$0.45	Loose rock.....cubic yard.....	\$1.00
Cofferdam timber.....M feet B. M.....	39.00	Solid rock.....do.....	1.00
Timber in permanent work.....do.....	39.00	Deposit.....do.....	.20
Stone masonry.....cubic yard.....	90.00	Embankment.....do.....	.25
Paving.....square yard.....	2.00	Puddling.....do.....	8.00
Riprap.....cubic yard.....	2.00	Cofferdam filling.....do.....	1.00
Concrete.....do.....	4.50	Structural steel.....pound.....	.05
Earth excavation.....do.....	.60	Cast iron.....do.....	.05

### *Contract for furnishing Portland cement (Lehigh brand) for Locks Nos. 1 and 2, Big Sandy River, West Virginia and Kentucky.*

Name of contractor: Lehigh Portland Cement Company.

Date of approval: March 28, 1901.

Date of beginning: First consignment to be ordered for delivery on or about April 30, 1901.

Date of expiration: Contingent upon progress of the work; to expire by limitation on June 1, 1902.

[NOTE.—This contract has been practically completed, all cement having been delivered and all payments made with the exception of \$480.06 retained percentage, which is being held in view of a possible claim against the United States for damages by the Evansville Contract Company, account of delay in delivery of cement on time.]

Items.	Contract price.
LEHIGH PORTLAND CEMENT.	
Delivered at Catlettsburg, Ky. (4,000 barrels minimum, 10,000 barrels maximum):	
In standard paper bags.....per barrel.....	\$1.45
In barrels.....do.....	1.63
Delivered at Wrights, Ky. (6,000 barrels minimum, 12,000 barrels maximum):	
In standard paper bags.....per barrel.....	1.56
In barrels.....do.....	1.75

### *Contract for constructing Dam No. 1, with abutment and protection, Big Sandy River, West Virginia and Kentucky.*

Name of contractor: Sheridan-Kirk Contract Company.

Date of approval: April 18, 1903.

Date of beginning and date of expiration: Concrete must be completed within one hundred fair working days, Sundays excepted, after August 1, 1903; remaining work within sixty fair working days after the expiration of the one hundred days above specified.

Items.	Contract price (unit rate).	Items.	Contract price (unit rate).
Piling, round.....linear foot.....	\$0.50	Timber in permanent work.....	
Cofferdam timber.....M feet B. M.....	40.00	.....M feet B. M.....	\$30.00
Cofferdam filling.....cubic yard.....	.70	Ironwork.....pound.....	.085
Riprap.....do.....	2.00	Embankment.....cubic yard.....	.50
Earth excavation.....do.....	.42	Puddling.....do.....	8.00
Rock excavation.....do.....	2.00	Square paving.....square yard.....	8.00
Bolt holes in rock or masonry,.....linear foot.....	.40	Rough paving.....do.....	2.50
Concrete.....cubic yard.....	5.00	Removal of old cofferdam of lock.....whole work.....	500.00

# 1746 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

## *Contract for constructing Lock No. 2, Big Sandy River, West Virginia and Kentucky.*

Name of contractor: The Evansville Contract Company.

Date of approval: December 17, 1900.

Date of beginning: January 18, 1901.

Date of expiration: September 19, 1902; extended to December 31, 1902, by supplementary contract dated August 16, 1902. By indorsement Office Chief of Engineers, dated January 18, 1903 (E. D. 87192), the time limit was waived.

Items.	Contract price (unit rate).	Items.	Contract price (unit rate).
Piling (round).....linear foot..	\$0.50	Loose rock.....cubic yard..	\$0.25
Cofferdam timber.....M feet B. M.	60.00	Solid rock.....do.....	1.00
Timber in permanent work...do....	75.00	Deposit.....do.....	.20
Stone masonry.....cubic yard..	50.00	Embankment.....do.....	.25
Paving.....square yard.....	2.80	Puddling.....do.....	3.00
Riprap.....cubic yard.....	3.00	Cofferdam filling.....do.....	1.00
Concrete.....do.....	4.00	Structural steel.....pound..	.085
Earth excavation.....do.....	.50	Cast iron.....do.....	.085

## *Contract for furnishing about 5,000 barrels Atlas Portland cement at Catlettsburg, Ky., for use at Dam No. 1, Big Sandy River, West Virginia and Kentucky.*

Name of contractor: Atlas Portland Cement Company.

Date of approval: May 25, 1903.

Date of beginning: When ordered (paragraph 37).

Date of expiration: Depending upon progress of construction work (see paragraph 37).

Item.	Contract price.
About 5,000 barrels Atlas Portland cement, delivered at Catlettsburg, Ky....barrel..	o \$2.46

a Rebate of 10 cents allowed for each empty bag returned to point of delivery.

### COMMERCIAL STATISTICS.

## *Big Sandy River, West Virginia and Kentucky, including Tug and Levisa forks, for calendar year ending December 31, 1902, and prior years.*

Articles.	1897.	1898.	1899.	1900.	1901.	1902.
	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>
Timber.....	255,000	200,000	210,000	200,000	280,000	250,000
Hides.....			73		34	15
Leather.....					1	1
Lumber.....	800	800			13,000	98
Produce.....	5,000	12,000	13,300	15,000	9,000	6,000
Live stock.....	1,400	10,000	1,149	2,000	235	738
Spokes.....					10	55
Staves.....	1,000	2,000	452	1,000	3,480	1,720
Tan bark.....	800	500			550	35
Ties.....	48,000	90,000	48,000	50,000	44,000	44,057
Grain.....	500	600	600	600	154	195
Wool.....					2	2
Miscellaneous.....	100,000	100,000	60,820	29,000	19,000	47,614
Passengers.....	2,500	2,000	2,375	2,500	386	412
Total.....	414,500	417,400	345,778	300,000	349,862	350,985

# APPENDIX I I—REPORT OF LIEUT. COL. RUFFNER. 1747

*List of boats plying Big Sandy River, West Virginia and Kentucky, and Tug and Levisa forks of same.*

Name of boat.	Character.	Length.	Breadth.	Depth.	Tonnage.
		<i>Feet.</i>	<i>Feet.</i>	<i>Feet.</i>	
Big Sandy .....	Side-wheel .....	110	14	1.8	24.12
Sea Lion .....	Stern-wheel .....	122	22	3.5	127
Louisa .....	Side-wheel .....	90	9	2	
Maxie Yoata .....	do .....	117.6	15.6		47.12
H. M. Stafford .....	do .....	84	8	1.1	7.71
Cando .....	Stern-wheel .....	117.5	20	3	74
Alka .....	Side-wheel .....	116	19.2	3.2	45
J. M. Grubbs .....	Stern-wheel .....	90	20	3.2	47
Cricket .....	do .....	122	18.8	2.9	51
Catherine Davis .....	do .....	135	26	4	210
Donca .....	do .....	108.5	18.4	3	56
Sea Gull .....	Side-wheel .....	90	12	2.6	27
Eclipse .....	Stern-wheel .....	100	17	3.5	57
Vincennes .....	do .....	98.5	20	3.3	31.49
Guyandotte .....	Side-wheel .....	104	16	2.8	43.83
Miles H .....	Stern-wheel .....	96	18	3	46
Katie Mc .....	do .....	100	18	2.5	41
M. B. Goble .....	do .....	90	18	3.5	116

<sup>a</sup> Wrecked.

*List of vessels, rafts, etc., passing lock and dam on Big Sandy River during the calendar year ending December 31, 1902.*

Craft.	Up.	Down.	Total.
Steamboats .....	152	157	309
Barges and flats .....	38	42	80
Rafts .....		1,833	1,833
Ties .....		32,991	32,991
Miscellaneous .....		2	2

## I I 5.

### OPERATING AND CARE OF LOCK AND DAM (NO. 3) ON BIG SANDY RIVER, WEST VIRGINIA AND KENTUCKY.

Lock and Dam No. 3, the only one on this river at present, is located at Louisa, Ky., and was completed and open to navigation January 1, 1897.

The dam is movable and of the needle type. A full description is given in the Annual Report of the Chief of Engineers for 1897, pages 2534 et seq.

The dam was lowered for the winter on November 25, 1902, and the first spring raising occurred May 16, 1903.

During the fiscal year the paving was extended below the lock; the old wooden crib at head of river wall was removed and a concrete pier built in its place; the lock houses were painted; the upper part of the grounds was fenced; the slope behind lock paving was sodded; chains were made for needles, and a variety of repair work was performed.

The total amount expended during the year ending June 30, 1903, was \$4,170.97.

Commercial statistics are included in the report for improving Big Sandy River.

#### ALLOTMENTS.

July 23, 1897 .....	\$2,840.00	July 18, 1900 .....	\$3,177.09
July 23, 1898 .....	3,250.95	July 10, 1901 .....	3,658.12
July 19, 1899 .....	3,524.28	July 17, 1902 .....	5,075.88

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*Maneuvers of Lock and Dam No. 3 in Big Sandy River, West Virginia and Kentucky, at Louisa, Ky., for the fiscal year ending June 30, 1903.*

Raised July 11, 1902.  
Lowered November 25, 1902.  
Raised May 16, 1903.

*Summary of expenditures for operating and care of lock and dam on Big Sandy River, West Virginia and Kentucky, for the fiscal year ending June 30, 1903.*

Office expenses, superintendence, and contingencies .....	\$725.00
Labor .....	2,433.96
Expenses .....	93.95
Repairs .....	918.06
Total .....	4,170.97

## I I 6.

### IMPROVEMENT OF KENTUCKY RIVER, KENTUCKY.

A statement of the condition of the river in 1879, when it was turned over to the United States by the Commonwealth of Kentucky, will be found in the Annual Report of the Chief of Engineers for 1898, page 2012 et seq.

There are 8 locks and dams, of the projected series of 14, completed and in operation, and Locks and Dams Nos. 9 and 10 under construction. Lock No. 9 is located at Valley View, Ky., 158 miles from the mouth, and Lock No. 10 at Ford, Ky., 176 miles from the mouth.

The location and other information pertaining to the completed work of navigation will be found in the Annual Report of the Chief of Engineers for 1899, page 2523.

The work accomplished during the fiscal year is given below:

*Lock No. 9.*—The construction of the lock and dam under contract with the Sheridan-Kirk Contract Company has progressed favorably, the lock walls have been completed, the steel gates assembled and put in place, the upper and lower land cribs have been completed and partially filled with ballast, the lower triangular crib completed with exception of verticals and ballast, and the river crib built to a height of 550.6, the drain behind land wall nearly completed, and 9,500 cubic yards of material deposited behind the land wall of lock.

At the close of the year preparations were in progress for building the cofferdam to inclose the first section of the dam.

Under the contracts, entered into with J. B. Speed & Co. and the Virginia Portland Cement Company, all the cement required for this work has been ordered, delivered, and contracts closed.

*Lock No. 10.*—The construction of the lock and dam, including the lock houses and outbuildings, was let in one contract, except the cement, to the Mason and Hoge Company, of Frankfort, Ky., and they have established at the site of the work, as described on the accompanying drawing, one of the most complete plants for the successful execution of the work that has ever been erected by a contractor on any previous work under my charge.

The contractors have built and completed the lock houses and outbuildings; completed and pumped out the cofferdam inclosing the



# 1750 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

## ABSTRACT OF CONTRACTS IN FORCE ON KENTUCKY RIVER, KENTUCKY, DURING THE FISCAL YEAR ENDING JUNE 30, 1903.

### *Contract for constructing Lock and Dam No. 9, Kentucky River, Kentucky.*

Name of contractor: The Sheridan-Kirk Contract Company.

Date of approval: June 12, 1901.

Date of beginning: July 15, 1901.

Date of expiration: June 15, 1903. Extended to December 15, 1903.

[NOTE.—This contract was modified, with respect to construction of cofferdams, by supplementary contract dated April 21, 1903; approved May 11, 1903.]

Items.	Contract price (unit rate).	Items.	Contract price (unit rate).
Ballast.....cubic yard..	\$1.50	Iron and steel.....pound..	\$0.045
Cofferdam filling.....do..	.50	Masonry.....cubic yard..	50.00
Cofferdam timber.....M feet B. M..	26.00	Paving, if concrete.....square yard..	1.75
Concrete.....cubic yard..	3.90	Paving, if stone.....do..	2.75
Deposit.....do..	.50	Piles.....linear foot..	.80
Driftbolts.....pound..	.085	Timber in permanent construction.....M feet B. M..	42.00
Excavation, earth.....cubic yard..	.40	Valves.....set..	500.00
Excavation, rock.....do..	3.00	Winches.....do..	100.00
Embankment.....do..	.35		
Fence in place.....linear foot..	.25		
Hauling cement:			
If delivered by rail.....barrel..	.07		
If delivered by water.....do..	.07		

### *Contract for furnishing natural cement (Star brand) for Lock and Dam No. 9, Kentucky River, Kentucky.*

Name of contractor: J. B. Speed & Co.

Date of approval: June 24, 1901.

Date of beginning: First consignment to be ordered for delivery about July 15, 1901.

Date of expiration: Paragraph 39 of the specifications provides that deliveries may be required until October 1, 1902, on which date the contract will expire by limitation. The right is reserved to close the contract at any time after the delivery of the minimum number of barrels called for.

Item.	Contract price.
Natural cement, Star brand (2,800 barrels, minimum; 5,000 barrels, maximum), delivered free on board cars at Valley View, Ky., in standard paper bags.....barrel..	\$0.84

Completed.

### *Contract for furnishing Portland cement (Old Dominion brand) for Lock and Dam No. 9, Kentucky River, Kentucky.*

Name of contractor: Virginia Portland Cement Company.

Date of approval: June 18, 1901.

Date of beginning: First consignment to be ordered for delivery about July 15, 1901.

Date of expiration: Paragraph 39 of the specifications provides that deliveries may be required until October 1, 1902, on which date the contract will expire by limitation. The right is reserved to close the contract at any time after the delivery of the minimum number of barrels called for.

Item.	Contract price.
Portland cement, Old Dominion brand (11,200 barrels, minimum; 20,000 barrels, maximum) delivered free on board cars at Valley View, Ky., in standard paper bags.....barrel..	\$1.73

Completed.

**APPENDIX I I—REPORT OF LIEUT. COL. RUFFNER. 1751**

*Contract for furnishing about 15,000 barrels American Portland cement (Old Dominion brand) at Ford, Ky., for use in the construction of Lock and Dam No. 10, Kentucky River, Kentucky.*

Name of contractor: Virginia Portland Cement Company.  
 Date of approval: July 5, 1902.  
 Date of beginning: When ordered.  
 Date of expiration: December 31, 1903.

Item.	Contract price.
American Portland cement, Old Dominion brand (13,500 barrels, minimum; 19,500 barrels, maximum) delivered at Ford, Ky.:	
Delivered in barrels or bags.....barrel..	\$2.10
Rebate allowed on empty bags returned.....do....	.05

*Contract for building Lock and Dam No. 10, etc., Kentucky River, Kentucky.*

Name of contractor: Mason & Hoge Company.  
 Date of approval: June 30, 1902.  
 Date of beginning: August 3, 1902.  
 Date of expiration: August 3, 1905.

Items.	Contract price (unit rate).	Items.	Contract price (unit rate.)
Cofferdam timber...M feet B. M....	\$35.00	Concrete.....cubic yard..	\$3.80
Timber in permanent construction...M feet B. M....	50.00	Riprap.....do.....	1.50
Piling.....lineal foot.....	.40	Stone masonry.....do.....	50.00
Cofferdam filling.....cubic yard.....	.50	Iron and steel.....pound.....	.054
Embankment.....do.....	.35	Driftbolts.....do.....	.04
Earth excavation.....do.....	.40	Fence.....lineal foot.....	.15
Rock excavation.....do.....	2.00	Dwellings.....each.....	2,500.00
Deposit.....do.....	.40	Outbuildings.....do.....	150.00
		Cisterns.....do.....	100.00

\* \* \* \* \*

**REPORT OF MR. W. H. McALPINE, JUNIOR ENGINEER.**

U. S. ARMY QUARTER BOAT,  
 Cleveland, Ky., May 29, 1903.

DEAR MR. WALTHERS: I have the honor to make the following report of the check-level survey from Lock No. 10 to Lock No. 9, Kentucky River, made by me in accordance with Colonel Ruffner's letter of May 9, 1903:

Upon the arrival of the quarter boat at Lock No. 10, on the noon of May 12, I took charge and organized the following crew: Lige Anderson, watchman (regular watchman who came up with the boat from Frankfort); C. O. Williams, cook; C. C. Stuart and J. D. Johnson, laborers; W. H. McAlpine, junior engineer—five of us, all told. I then provisioned the boat and started down river with the levels the next afternoon. The country was very rough from Lock No. 10 to Elk Lick, and I did not average over a mile and one-half a day, as about one-half the time was taken in moving the boat. We had to take the quarter boat over several bad ripples and falls. At Howards Creek and at Elk Lick I had to hire additional hands to assist me. On May 20 I tried to get the boat over Elk Lick shoals, but after trying for six hours I gave up the attempt. The next day I hired two extra men and succeeded in getting the boat back into deep water. The rest of the survey was made by using the skiff, coming back to the quarter boat at night and finally staying at Valley View when it became too far to row back to the boat. I completed the levels on May 27, and on May 28 I took the skiff back to the quarter boat.

Before beginning the survey I took the original level notes and the check-level notes and checked them over and made a table of the elevations of the bench marks and the description of each from Lock No. 10 to Lock No. 9. I inclose a copy of this table, together with the elevations of the bench marks as obtained by me.

1752 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

In only two cases, viz, Nos. 35 and 81, I failed to find the bench mark. In two or three other cases the nail had rotted out so it was impossible to tell the exact point within one or two tenths of a foot. As a rule my results did not differ very greatly from the surveys of 1899 and 1900, and was quite often between the two. In no instance did I find sufficient discrepancy to warrant rerunning my lines. Each day I checked over my notes and on the completion of the work I rechecked them by adding up the foresights and backsights between each bench mark, the work of which I submit with this report. I will also return to the office my level notes and all level books in my possession for further reference.

It will be seen from the accompanying table that the three surveys check very closely on No. 19, the last reliable bench mark, and also on No. 18, where the nail has rotted out. I carried the levels to the top of Dam No. 9, the elevation of which I made to be 551.03, the elevation of which is called 550.60, but the elevation of the levels were lowered at Lock No. 9 0.4 by Mr. Watt, and this would make the actual elevation of the top of the dam 551, a very close check with work. The bench marks are about one mile apart, and as to the possibility of all three surveys being in error 1 foot, it will be seen from the table that the error must have been made by all these parties within the same 2 miles, otherwise it would have been detected.

This would be most unlikely, and I see no cause why the original levels are not correct.

Very respectfully,

W. H. MCALPINE,  
Junior Engineer.

Mr. CHAS. F. WALTHERS,  
Assistant Engineer.

[First indorsement.]

U. S. ENGINEER OFFICE,  
Richmond, Ky., May 31, 1903.

Respectfully forwarded to Col. E. H. Ruffner, recommending to assume the levels checked as correct.

Mr. McAlpine is at Richmond now, and Mr. Lige Anderson, with the quarter boat, ought to be at No. 9 shortly, as a slight rise is expected; both at your disposition.

CHAS. F. WALTHERS,  
Assistant Engineer.

Table showing elevation of bench marks from Lock No. 9 to Lock No. 10 (surveys of 1899, 1900, and 1903).

Number of bench mark.	Survey of 1899.	Check survey of 1900.	Check survey of 1903 (W. H. McAlpine).
Black locust	580.60		580.60
36	566.15	566.28	566.165
35	561.46	561.60	(a)
34	569.42	569.48	569.295
33	547.36	547.45	547.295
32	b 548.09	547.75	547.310
31	546.90	547.05	(a)
30	598.09	597.88	597.535
29	b 549.76	548.48	548.285
28	549.41	549.58	549.495
27	549.65	549.83	549.785
26	544.76		544.885
25	549.71	549.79	549.680
24	b 568.36	566.66	566.525
23	571.64	571.81	571.660
22	562.47	562.66	562.515
21	561.64	561.55	561.320
20	540.80		540.725
19	543.83	543.97	543.700
18	540.01	540.18	540.04
Top of dam	c 551.00		551.030

a Bench mark on ledge and could not find a trace of red paint.

b The difference of over 1 foot between the original levels and the check levels of 1900 in these three cases is difficult to account for. It is possible in the cases of No. 33 and No. 29 that the tree may have slipped down the bank afterwards. In the case of No. 24 this is high up the bank and in perfect condition. It is probable a wrong rod reading was made here, and as it was not used for a turning point, it did not show up at the next bench mark.

c 550.60+0.40=551 bench mark at Lock No. 9 lowered 0.4 by J. M. G. Watt.

## I I 7.

OPERATING AND CARE OF LOCKS AND DAMS ON KENTUCKY RIVER,  
KENTUCKY.

The eight completed locks in Kentucky River were opened to navigation during the past fiscal year except during periods of freshets; at Locks Nos. 1 and 2 navigation was suspended eighty-four days, from August 28 to November 19, 1902, both dates inclusive, on account of the draining of Pool No. 1 to permit reconstruction of Dam No. 1.

Locks were submerged by freshets during the year as follows: Lock No. 1, seventy-five days; Lock No. 2, forty-seven days; Lock No. 3, eighteen days; Lock No. 4, sixteen days; Lock No. 5, eleven days; Lock No. 6, ten days; Lock No. 7, twenty-three days, and Lock No. 8, twenty days.

A depth of 6 feet at pool stage exists at close of year throughout the improved portion of the river, except in lower entrance at Lock No. 2, where there is 5.85 feet.

Work accomplished during past year has been as follows:

*Lock No. 1.*—Repairs to abutment crib and dam were made under formal contract with Hollerbach & May. The old and rotting timber work was removed and replaced with Louisville cement concrete with a Portland cement facing. Cross section of dam was changed from step to a slope with apron.

Minor repairs were also made to house, grounds, and fencing.

*Pool No. 1.*—Advantage was taken of the draining of Pool No. 1 to equip a snagging party with small quarterboat, skiffs, axes, saws, and dynamite, with the result of placing this pool in good condition. Snags, stumps, and logs of long standing and endangering safety of steamboats and coal barges were removed from channel way and many overhanging trees cut to pieces.

Snags, logs, and stumps from 6 inches to 72 inches diameter removed.....	10, 202
Trees cut to pieces 3 inches to 40 inches diameter.....	28, 454
Cubic yards of rock removed from channel.....	65

*Lock No. 2.*—Mr. John Short, contractor for renewal of lower approach cribs (new work of concrete) and removal of rock ledge in lower entrance, failed to complete his contract. The approach cribs are 90 per cent completed and rock ledge 75 per cent removed.

The fixed dam was repaired by reconstruction of a portion of lower slope and apron with concrete. This work was not completed.

Minor repairs to lock houses and grounds were made and a cistern constructed for lockmaster's use.

*Lock No. 3.*—The contractor, John Short, failed to complete the renewal of lower land crib. The old timber crib was torn down, but work of reconstruction with concrete not started.

Mr. Short has been authorized to complete his contract at Locks Nos. 2 and 3, under an open-market agreement.

Minor repairs were made to houses, grounds, and dam.

*Lock No. 4.*—Minor repairs to grounds were made and new fencing placed; two barges of coal were unloaded and placed in coal bin.

A warehouse 34 by 90 by 10 feet, with tin roof, has been constructed in which to store and repair machinery, as well as a blacksmith shop and oil house.

This locality will be used as a distributing point for supplies and materials and a central point of storage for all property appertaining to the Kentucky River, and where tools and machinery will be kept in good repair. A storekeeper has been appointed to care of property and make repairs.

*Lock No. 5.*—Minor repairs to houses and grounds have been made. The overhanging portion of the lower river approach crib, in bad state of repairs, has been removed.

*Lock No. 6.*—Minor repairs to houses have been made.

*Lock No. 7.*—No work done except construction of fencing and minor repairs to houses.

*Lock No. 8.*—Minor repairs to houses and grounds. Owing to stage of water no repairs were made to this dam.

*United States dredges.*—Both dredges have been actively employed during the working season.

*Dredge No. 1* excavated and deepened channels at Leestown, Clifton, Buck Run, Redmans, White Oak, Little Hickman, and Canoe Creek bars; removed one sunken barge at the foot of Shelby street, Frankfort, Ky., and assisted in the repair work at Lock No. 2. Total amount of material removed, 62,366 cubic yards.

*Dredge No. 2* removed deposits from all lock pits and approaches and assisted in work of repairs to Dam No. 2. Total amount of material removed, 80,066 cubic yards.

*U. S. S. General O. M. Poe.*—Undergoing repairs at Louisville, Ky., until August 15, 1902. Has since been engaged in general towing of dredges and barges with material for repairs at various locks, tending dredges, etc.

*Chartered steamer Minnie.*—The steamer *Minnie* was chartered to act as tender to *Dredge No. 2* from May 23 to June 27, 1903.

## ALLOTMENTS.

July, 1884.....	\$15,000.00	August 2, 1897 .....	49,272.11
July, 1885.....	27,615.00	July 15, 1898.....	53,531.39
July 31, 1886.....	33,965.00	July 29, 1899.....	63,894.24
July, 1887.....	79,862.14	May 11, 1900.....	2,500.00
July, 1888.....	82,478.50	July 17, 1900.....	82,284.09
July 28, 1889.....	72,394.80	July 9, 1901.....	109,137.49
July 17, 1890.....	28,889.07	August 19, 1901.....	952.00
July 16, 1891.....	36,331.38	February 4, 1902.....	19,000.00
November 28, 1891.....	1,112.50	July 22, 1902.....	79,634.91
December 14, 1891.....	11,382.80		
July 15, 1892.....	38,503.62	Total .....	1,138,550.23
June 13, 1893.....	2,000.00	Amount received from	
July 14, 1893.....	73,065.02	other sources in previ-	
July 16, 1894.....	46,435.28	ous years .....	14.15
July 20, 1895.....	59,120.04		
July 24, 1896.....	70,198.85	Total .....	1,138,564.38

*Summary of expenditures for operating and care of locks and dams on Kentucky River, Kentucky, for fiscal year ending June 30, 1903.*

Office expenses, superintendence, and contingencies .....	\$9,781.66
Labor .....	36,528.17
Fuel .....	5,138.67
Expenses .....	2,581.85
Repairs .....	65,380.08
Total .....	119,355.43

# APPENDIX I I—REPORT OF LIEUT. COL. RUFFNER. 1755

## ABSTRACT OF CONTRACTS IN FORCE, OPERATING AND CARE KENTUCKY RIVER, DURING THE FISCAL YEAR ENDING JUNE 30, 1903.

### *Contract for renewal of dam and abutment crib at Lock No. 1, Kentucky River, Kentucky.*

Name of contractor: Hollerbach & May.

Date of approval: April 26, 1902.

Date of beginning: As soon as stage of river permits.

Date of expiration: December 1, 1902, unless delayed by unusual high water, in which event the work shall be resumed within one month after receiving notice to begin again, and shall be completed before September 1, 1903.

[NOTE.—This contract was practically completed on time, only 52.8 cubic yards of concrete yet remaining to be placed, which is delayed awaiting a favorable stage of water.]

Items.	Contract price (unit rate).	Items.	Contract price (unit rate).
RENEWAL OF DAM NO. 1.		RENEWAL OF ABUTMENT CRIB, DAM NO. 1.	
Crib excavation .....cubic yard..	\$0.90	Earth excavation .....cubic yard..	\$0.50
Concrete .....do.....	4.50	Crib excavation .....do.....	.90
Riprap .....do.....	1.50	Concrete .....do.....	4.50
Coffer lumber .....M. feet B. M.....	50.00	Riprap .....do.....	1.50
Cement .....barrel.....	1.80	Piling .....linear foot..	.90
Piling .....linear foot..	.80		

### *Contract (emergency) for furnishing Portland cement for repairs to Dam No. 1, Kentucky River, Kentucky.*

Name of contractor: Castalia Portland Cement Company.

Date of approval: Emergency contract.

Date of beginning and date of expiration: Depending upon progress of repairs.

Item.	Contract price.
Portland cement, Tiger brand (380 barrels minimum; 525 barrels maximum), delivered free on board cars at Worthville, Ky., in wooden barrels.....barrel..	\$1.88

Completed.

### *Contract (emergency) for furnishing natural cement for repairs to Dam No. 1, Kentucky River, Kentucky.*

Name of contractor: J. B. Speed & Co.

Date of approval: Emergency contract.

Date of beginning and date of expiration: Depending upon progress of repairs.

Item.	Contract price.
Natural cement, Star brand (2,380 barrels minimum, 5,400 barrels maximum), delivered free on board cars at Worthville, Ky., in wooden barrels.....barrel..	\$0.94

Completed.

# 1756 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

*Contract for renewal of cribs at Locks Nos. 2 and 3, and removal of rock ledge at entrance of Lock 2, Kentucky River, Kentucky.*

Name of contractor: John Short.

Date of approval: May 26, 1902.

Date of beginning: Items Nos. 2 and 3 may be commenced at any time after May 1; item No. 4, at any time after June 1, 1902, to be subject to the approval of the engineer in each case.

Date of expiration: Item No. 2, November 1, 1902; items 3 and 4, October 1, 1902.

[NOTE.—Account of unsatisfactory progress, this contract was annulled on December 10, 1902 (E. D. file 42673-10.) By E. D. file 42673-19 the contractor was permitted to complete the work by open-market agreement.]

Item.	Contract price (unit rate.)
<b>ITEM 2, RENEWAL LOWER CRIBS, LOCK 2.</b>	
Earth excavation.....cubic yard..	\$0.60
Crib excavation.....do.....	.75
Embankment.....do.....	.60
Concrete.....do.....	5.20
Riprap.....do.....	1.50
<b>ITEM 3, RENEWAL OF LOWER CRIB, LOCK 3.</b>	
Earth excavation.....cubic yard..	.60
Crib excavation.....do.....	.75
Embankment.....do.....	.60
Concrete.....do.....	5.20
Riprap.....do.....	1.50
<b>ITEM 4, REMOVAL ROCK LEDGE, LOCK 2.</b>	
Rock excavation.....cubic yard..	4.00

\* \* \* \* \*

## COMMERCIAL STATISTICS.

*Statement of traffic passing the locks on Kentucky River during the calendar years 1899, 1900, 1901, and 1902.*

Lock No.—	Passenger boats.				Towboats.				Government boats.			
	1899.	1900.	1901.	1902.	1899.	1900.	1901.	1902.	1899.	1900.	1901.	1902.
1.....	900	1,007	695	891	172	160	217	149	41	36	13	26
2.....	819	705	588	317	169	162	209	131	44	32	36	42
3.....	343	371	244	251	162	134	194	148	56	40	81	118
4.....	344	380	262	306	179	172	210	172	80	48	66	173
5.....	234	262	199	203	64	65	78	53	89	66	50	51
6.....	188	209	183	186	47	40	32	28	76	57	55	56
7.....	167	196	181	203	33	25	41	34	68	61	41	46
8.....	.....	13	76	78	.....	6	22	15	.....	2	31	32
Total..	2,995	3,143	2,428	1,935	826	764	1,003	730	454	342	373	544

Lock No.—	Coal barges.				Other barges.				Small crafts.			
	1899.	1900.	1901.	1902.	1899.	1900.	1901.	1902.	1899.	1900.	1901.	1902.
1.....	225	205	208	124	141	196	131	239	77	64	84	52
2.....	191	181	186	92	113	97	137	115	72	43	47	35
3.....	188	176	188	86	207	90	257	238	69	49	90	62
4.....	193	194	186	88	145	135	204	272	87	135	142	154
5.....	68	61	60	30	402	132	122	166	103	146	80	96
6.....	27	33	22	17	125	120	107	159	163	135	206	175
7.....	21	28	27	17	206	109	96	160	172	175	149	121
8.....	.....	2	7	5	.....	70	49	61	.....	20	74	62
Total..	913	880	884	459	1,339	949	1,103	1,410	743	767	872	756

# APPENDIX I I—REPORT OF LIEUT. COL. RUFFNER. 1757

*Statement of traffic passing the locks on Kentucky River during the calendar years 1899, 1900, 1901, and 1902—Continued.*

Lock No.—	Rafts.				Total.			
	1899.	1900.	1901.	1902.	1899.	1900.	1901.	1902.
1.....	163	335	537	213	1,719	2,003	1,885	1,194
2.....	165	342	508	208	1,573	1,562	1,711	940
3.....	159	339	501	217	1,184	1,199	1,555	1,120
4.....	165	331	506	236	1,193	1,395	1,576	1,401
5.....	808	1,266	1,648	1,084	1,768	1,998	2,237	1,682
6.....	806	1,289	1,644	940	1,432	1,883	2,249	1,561
7.....	814	1,284	1,588	1,109	1,481	1,878	2,123	1,690
8.....	.....	93	1,883	1,501	.....	206	2,142	1,754
Total..	3,080	5,279	8,815	5,508	10,850	12,124	15,478	11,342

Lock No.—	Increase (+) or decrease (-) 1902.	Total tonnage.				Increase (+) or decrease (-) 1902.	Lockages.			
		1899.	1900.	1901.	1902.		1899.	1900.	1901.	1902.
1.....	-691	203,237	185,121	183,773	138,370	-45,403	1,400	1,583	1,221	714
2.....	-771	187,580	166,068	176,283	111,190	-65,093	1,362	1,280	1,304	719
3.....	-435	159,482	149,588	191,051	114,862	-76,189	986	1,030	1,200	867
4.....	-175	158,351	157,664	161,719	131,045	-30,674	1,029	1,114	1,173	1,101
5.....	-555	182,956	168,948	186,461	137,509	-48,952	1,119	1,325	1,303	1,081
6.....	-688	121,628	154,609	170,499	124,870	-45,629	750	883	1,068	843
7.....	-433	127,000	152,592	168,750	131,413	-37,337	871	859	966	833
8.....	-388	.....	22,039	166,109	132,038	-34,071	.....	135	879	692
Total..	.....	1,140,234	1,154,629	1,404,645	1,021,297	-383,348	7,517	8,209	9,114	6,850

NOTE.—The decrease of tonnage passing the locks during the calendar year ending December 31, 1902, over the previous year is 383,348 tons. Navigation suspended between Lock No. 1 and Lock No. 2 from August 28 to November 20, 1902, on account of repairs to Dam No. 1 and renewal of lower cribs to Lock No. 2.

*Statement of commerce, in tons, passing the locks on Kentucky River, Kentucky, during the calendar years 1899, 1900, 1901, and 1902.*

Articles.	Lock No. 1.				Lock No. 2.			
	1899.	1900.	1901.	1902.	1899.	1900.	1901.	1902.
Coal .....	55,273	53,147	55,742	34,554	51,179	47,055	51,656	27,525
Grain .....	4,858	8,391	6,122	2,787	4,529	8,170	6,493	2,323
Salt .....	748	768	1,074	540	571	666	824	415
Oil .....	530	493	543	274	394	280	378	199
Whisky .....	1,476	1,239	1,128	1,128	1,648	1,343	1,295	1,200
Flour .....	1,287	1,286	1,264	1,380	725	725	542	994
Sugar .....	371	277	287	210	217	188	122	157
Molasses .....	182	138	123	80	169	91	62	69
Cement .....	1,317	499	355	521	1,184	853	172	333
Tobacco .....	4,078	4,385	4,576	3,305	2,467	2,924	3,267	1,923
Hay .....	1,703	932	221	867	490	537	122	608
Livestock .....	1,377	931	952	650	594	450	490	357
Lumber and timber .....	13,206	24,697	39,841	29,212	12,511	25,174	37,614	17,046
Shingles .....	332	934	201	111	188	343	62	85
Manufactured iron .....	521	290	144	115	463	418	133	153
Produce .....	731	534	107	118	411	236	66	100
General and miscellaneous .....	8,661	14,882	9,505	8,646	6,099	6,500	5,219	4,125
Total.....	96,651	113,823	122,185	84,472	83,839	95,353	108,517	57,612
Number of passengers.....	9,059	8,900	7,110	5,075	6,118	6,285	3,789	4,265



# 1758 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

*Statement of commerce, in tons, passing the locks on Kentucky River, Kentucky, during the calendar years 1899, 1900, 1901, and 1902—Continued.*

Articles.	Lock No. 3.				Lock No. 4.			
	1899.	1900.	1901.	1902.	1899.	1900.	1901.	1902.
Coal.....	47,159	46,409	47,026	27,243	46,218	44,490	42,078	26,467
Grain.....	4,280	6,877	6,242	2,704	4,882	7,645	6,432	2,325
Salt.....	540	443	1,221	286	816	845	634	177
Oil.....	225	176	153	104	221	186	164	71
Whisky.....	1,644	1,387	1,196	1,114	1,574	1,207	1,106	1,572
Flour.....	840	414	860	686	807	311	321	508
Sugar.....	131	115	73	86	116	68	44	83
Molasses.....	64	80	40	33	62	66	39	21
Cement.....	1,055	240	90	498	1,249	179	100	539
Tobacco.....	1,047	1,103	1,209	1,145	802	422	396	286
Hay.....	853	851	123	524	345	352	118	505
Livestock.....	284	231	194	179	110	188	79	71
Lumber and timber.....	10,947	27,783	35,733	19,000	13,001	23,204	36,925	18,523
Shingles.....	96	138	67	46	72	177	61	21
Manufactured iron.....	369	268	33	197	888	143	16	102
Produce.....	129	66	18	102	117	139	18	52
General and miscellaneous.....	3,907	4,785	9,981	3,911	3,633	4,938	3,610	5,368
Total.....	72,570	90,866	103,761	57,738	72,983	84,006	92,131	56,671
Number of passengers.....	3,837	4,367	1,681	3,732	3,996	4,167	1,973	3,884

Articles.	Lock No. 5.				Lock No. 6.			
	1899.	1900.	1901.	1902.	1899.	1900.	1901.	1902.
Coal.....	16,219	13,664	15,392	9,605	5,523	7,273	6,390	5,027
Grain.....	3,756	5,840	4,666	2,254	3,726	5,445	3,764	2,349
Salt.....	165	160	231	133	119	89	168	68
Oil.....	102	41	58	22	53	27	64	9
Whisky.....	1,670	1,622	1,194	1,217	1,456	1,235	935	1,066
Flour.....	239	60	112	111	75	56	85	124
Sugar.....	24	11	15	11	12	8	11	10
Molasses.....	5	13	23	4	4	13	17	3
Cement.....	794	70	60	125	782	65	35	80
Tobacco.....	230	273	282	70	152	156	170	32
Hay.....	127	143	21	449	48	26	10	445
Livestock.....	72	74	46	89	32	43	56	5
Lumber and timber.....	58,722	95,172	123,757	80,346	60,229	96,983	124,785	77,665
Shingles.....	88	147	21	13	27	2	19	1
Manufactured iron.....	182	68	8	33	65	67	11	6
Produce.....	31	10	4	50	23	8	2	10
General and miscellaneous.....	1,560	2,353	1,244	1,351	969	1,696	823	1,053
Total.....	83,826	119,711	147,134	95,833	73,300	113,192	137,345	87,973
Number of passengers.....	3,244	3,300	3,139	2,802	2,468	3,196	4,017	3,640

Articles.	Lock No. 7.				Lock No. 8.			
	1899.	1900.	1901.	1902.	1899.	1900.	1901.	1902.
Coal.....	4,996	6,525	5,017	5,027	.....	163	1,453	1,081
Grain.....	3,451	4,786	4,433	1,957	.....	6	16	185
Salt.....	94	100	171	71	.....	21	102	70
Oil.....	31	13	49	5	.....	.....	15	5
Whisky.....	1,512	1,322	930	743	.....	.....	41	.....
Flour.....	49	34	73	55	.....	3	39	14
Sugar.....	6	2	6	8	.....	1	3	.....
Molasses.....	2	4	7	.....	.....	.....	2	.....
Cement.....	644	123	18	82	.....	5	12	.....
Tobacco.....	192	87	88	20	.....	4	76	.....
Hay.....	58	29	5	442	.....	.....	1	.....
Livestock.....	43	45	64	19	.....	10	25	8
Lumber and timber.....	57,445	99,463	123,822	83,369	.....	8,023	140,902	111,795
Shingles.....	12	10	9	.....	.....	.....	2	.....
Manufactured iron.....	91	115	19	2	.....	1	15	4
Produce.....	186	13	6	.....	.....	10	12	.....
General and miscellaneous.....	25,572	14,784	756	1,296	.....	101	4,346	570
Total.....	94,379	127,405	135,473	98,101	.....	8,348	147,062	113,682
Number of passengers.....	3,073	2,816	3,663	2,992	.....	142	1,864	1,475

Navigation suspended at Lock No. 1 August 28 to November 19, 1902.

# APPENDIX I I—REPORT OF LIEUT. COL. RUFFNER. 1759

*List of boats plying the Kentucky River, Kentucky, during calendar year ending December 31, 1902.*

Name of boat.	Character.	Length.	Breadth.	Depth.	Tonnage.
		<i>Fed.</i>	<i>Fed.</i>	<i>Fed.</i>	
Gen'l O. M. Poe.....	United States towboat....	145.60	34	4.6	150
Col. G. L. Gillespie.....	do.....	130	24	4.6	120
Pearl.....	United States launch.....	40	8	4	5
Falls City.....	Packet.....	151.67	36	4.4	235 35
Golden Gate.....	do.....	131.40	30	4	142
Bellevue.....	do.....	120	24	3.6	99
E. T. Slider.....	do.....	110	24	3.5	92
Reba Reeves.....	do.....	106.40	21.8	3.4	68
Mildred.....	do.....	116	24	3	92
Minnie.....	do.....	73	16	2.8	68
Louise.....	do.....	60.40	9.5	2	9
Dove.....	do.....	47	8	1.5	18
Delora.....	do.....	55	12	8	10
Fannie.....	do.....	55	11	2.4	10
Three Friends.....	do.....	55	8	2	5
Charley Boy No. 2.....	do.....	58	10.5	2.6	44.96
Juniata.....	do.....	45	18	2.8	22
Al Martin.....	Towboat.....	112	28	4	96
Uncle Sam.....	do.....	109.4	20	3.2	57
Innovator.....	do.....	100	20	3	62
Gladys.....	do.....	76	11	2.6	60
Edmund.....	do.....	56	12	3	14
Blue Wing.....	do.....	62	11	1.5	40
J. M. Thomas.....	do.....	60	12	3.4	18
Gunther.....	do.....	30	7	3.5	4.50
Champion.....	Sawmill boat.....	89	19.8	3.9	66
Dixie.....	Pleasure boat.....	45	8	4	3.72
Silver Star.....	do.....	65	10	4	13
Newt Cooper.....	do.....	45	8.6	2.6	11
Dauntless.....	do.....	40	8	4	5
O-ess-A.....	do.....	40	7	5	6
Williamette.....	do.....	40	8	4	10
Olaca.....	do.....	35	8	3	3
Sweetheart.....	do.....	33	6.4	3	3
Pomona.....	do.....	33	6	3	3
Katherine L.....	do.....	30	7	3.5	5
Merry Huston.....	do.....	32	8	4.6	4
Edna Roberts.....	do.....	32	6	4	2
Ebbie.....	do.....	25	6.5	3.2	3
Emily.....	do.....	25	6	2.6	1.50
Ione.....	do.....	21	5.6	3.6	2
Dupont.....	do.....	21	5.6	3	2
Mary Wood.....	do.....	21	6.2	3	1.50
Bernadotte.....	do.....	20	5	2.5	1.50
Sarah.....	do.....	18	4	3	2
Clarrisa.....	do.....	20	5.6	3	2
Emma May.....	do.....	33	8.6	2.8	3

*List of leases in force during the fiscal year ending June 30, 1903, Kentucky River, Kentucky.*

Location: Lock No. 4.  
 Lessee: Kentucky River Mills.  
 Dated: July 10, 1878.  
 Expires: July 10, 1977.  
 Annual rental: \$180.

## REPORT OF MR. CUMBERLAND H. RUMBOLD, JUNIOR ENGINEER.

UNITED STATES ENGINEER OFFICE,  
 Cincinnati, Ohio, December 10, 1902.

COLONEL: I have the honor to submit herewith a report on operations at Lock No. 1, Kentucky River, during the year 1902.

The contract for the "Renewal of dam" and "Renewal of abutment" (two items) at Lock No. 1, Kentucky River, was let on April 1, 1902, to Messrs. Hollerbach & May, contractors, of Evansville, Ind., under "Operation and care."

The contractors arrived at the site with their plant on July 7, 1902.

# 1760 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

The plant was an excellent one, consisting of a derrick boat, stationary and movable derricks, concrete mixers, a sand-and-gravel digger, electric-light plant, barges, etc., and both of the contractors were on the work continuously until its completion, using every effort to carry it through successfully.

Owing to a high stage of water, work was not allowed to be begun on tearing out the old abutment till August 29.

For the same reason, the renewal of the old dam was not commenced until August 28.

The old dam was a timber structure, of the step type, originally constructed by the State of Kentucky in 1841-1844, and altered and repaired on several occasions since it was turned over to the United States in 1880.

Under the above items it was originally intended to renew it with a timber dam on the same plan as the old, but later it was decided to build the new structure out of concrete and change its shape to a slope dam.

On the accompanying sketch the old four-step timber dam is shown by dotted lines.

Concreting on the dam was commenced on September 10, and was pushed through continuously, without the loss of a day, to completion, which was accomplished on November 11.

The old dam was torn out to a sufficient depth to insure a good foundation with a minimum of concrete of 4 feet in thickness in the body of the dam and of 8 feet at the crest, gradually decreasing on either side.

The concrete was composed of 1 part Louisville cement, "Star" brand; 2 parts of sand and 4 of gravel, and was faced with a 2-inch facing of Portland-cement mortar mixed in proportions of 1 cement to 2 sand. Several brands of Portland cement were used: Atlas, Alpha, Alsen's, and Castalia, all of which showed up well.

At the back of the dam proper, a 2-foot wall of concrete was placed, going down to a sufficient depth to insure a good foundation and preclude the possibility of any leaks, and this was found to be possible without resorting to the use of piling, as provided in the original plans and specifications, since the material encountered back of the old breast was found in far better condition than was anticipated. For about one-half the distance across the dam from the lock wall, the old structure rested on a solid rock foundation. From that point the ledge of rock sinks and thence across the river the dam rests on piling.

The use of cofferdams provided in the specifications was found unnecessary, owing to the favorable stage of the river during the prosecution of the work.

The concrete mixer used was a "Smith No. 3," manufactured at Milwaukee, Wis. This machine gave an excellent mix and turned out from 100 to 200 cubic yards of concrete per day.

The length of the new dam at the crest was 423.75 feet; at the toe 428 feet, with an average breadth of 75 feet.

The excavation of the old dam amounted to 6,920.74 cubic yards.

The following materials were used in construction:

Louisville cement concrete .....	cubic yards..	6,712.46
Portland cement facing .....	do.....	200.00
Riprap cement .....	do.....	472.20

The abutment to be renewed consisted of the lower river crib on the east side of the river. Work on this was carried on at different times during the construction of the dam and was completed on December 5, 1902, with the exception of about 50 cubic yards of concrete which it was impossible to place, owing to high water. In its construction only a sufficient amount of timber was used to insure stability of the work during construction and the subsequent setting of the concrete, the object being, after the decay of the outside timbers, to secure, as far as possible, a solid concrete abutment.

Details of the construction are shown in accompanying sketch, the specifications for concrete and facing being similar to those of the new dam. All 10 by 10 inch timber and all driftbolts were supplied by the United States.

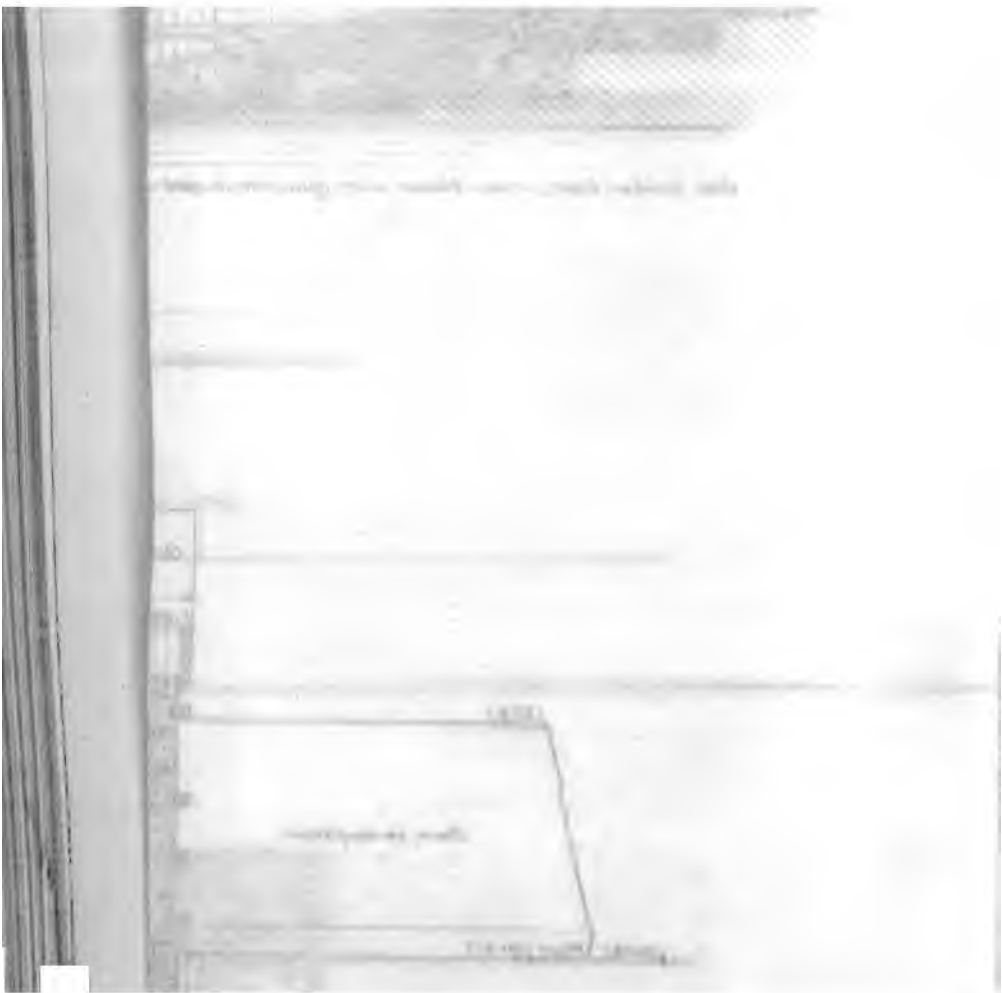
For additional security the structure was anchored to the bank behind by "dead-men" attached to seven-eighths inch galvanized wire lines which were fastened at the other end to anchors embedded in the concrete. Thirty-two piles were driven in the foundation—12 on the river front, averaging 18 inches in diameter, and 20 behind, 10 inches in diameter, the former being shod with cast-iron points. These piles and points were supplied by the United States.

Some difficulty was experienced in driving these piles on account of the condition of the bottom of the river at this point, which consisted of loose stones, old cribbing, and debris of all kinds.

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of this*

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# APPENDIX I I—REPORT OF LIEUT. COL. RUFFNER. 1761

Between the piles the spaces were filled with riprap consisting of large stones and the piling was run out to a toe from 8 to 10 feet in front of the abutment. The total length of the abutment was 147½ feet, and it was built in steps conforming to the slope of the dam.

The excavation of the old abutment amounted to 1,208 cubic yards.

The following materials were used in its construction:

Louisville cement concrete .....	cubic yards..	828.4
Portland cement facing.....	do.....	20
Riprap .....	do.....	1,106
Piling.....	linear feet..	615
Georgia pine timber, 10 by 10 inches.....	do.....	2,800
Sheeting, 2 by 12 inches.....	do.....	2,800
Cost of dam.....		\$38,130.94
Cost of abutment.....		\$6,772.61

The small amount of concreting necessary to complete the abutment, and which was impossible to place owing to high water at the close of the working season last year, was put in place and this work completed on May 29, 1903.

Very respectfully,

CUMBERLAND H. RUMBOLD,  
*Junior Engineer.*

Lieut. Col. E. H. RUFFNER,  
*Corps of Engineers.*



## APPENDIX J J.

IMPROVEMENT OF FALLS OF OHIO RIVER; OF WHITE RIVER, INDIANA;  
OF WABASH RIVER, INDIANA AND ILLINOIS, AND OF CERTAIN RIVERS  
IN KENTUCKY.

REPORT OF MAJ. G. McC. DERBY, CORPS OF ENGINEERS, OFFICER IN  
CHARGE, FOR THE FISCAL YEAR ENDING JUNE 30, 1903, WITH OTHER  
DOCUMENTS RELATING TO THE WORKS.

### IMPROVEMENTS.

- |  |   |
|--|---|
| 1. Falls of Ohio River at Louisville, Kentucky.                      | 6. Green River, above the mouth of Big Barren River, Kentucky.                |
| 2. Operating and care of Louisville and Portland Canal, Kentucky.    | 7. Operating and care of locks and dams on Green and Barren rivers, Kentucky. |
| 3. Wabash River, Indiana and Illinois.                               | 8. Rough River, Kentucky.   |
| 4. Operating and care of lock and dam at Grand Rapids, Wabash River. | 9. Operating and care of lock and dam on Rough River, Kentucky.               |
| 5. White River, Indiana.   |   |

UNITED STATES ENGINEER OFFICE,  
*Louisville, Ky., July 17, 1903.*

GENERAL: I have the honor to transmit herewith the annual reports of the works under my charge for the fiscal year ending June 30, 1903.

This district was in charge of Maj. E. H. Ruffner, Corps of Engineers, to October 6, 1902, and in my charge since that date.

Very respectfully, your obedient servant,

G. McC. DERBY,  
*Major, Corps of Engineers.*

Brig. Gen. G. L. GILLESPIE,  
*Chief of Engineers, U. S. A.*

## J J I.

IMPROVEMENT OF FALLS OF OHIO RIVER AT LOUISVILLE,  
KENTUCKY.

A condensed description of original condition, outline of projects, and references to more detailed information will be found on page 452 of this report.

Operations during the fiscal year were limited to drilling, blasting, and removing disrupted rock from that part of the enlargement at the head of the Louisville and Portland Canal east of the former cross



## 1764 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

dam, and the repair of Wave Rock dike, Indiana Chute. On account of high water and ice, and the dredging plant used jointly on this work and the Louisville and Portland Canal being required so continuously for canal work, only 24,167 cubic yards, scow measure, disrupted rock were removed during the year. The drill scows resumed operations May 18, 1903, but were twice interrupted by high water before the end of the fiscal year. The work done by them was as follows:

Number of holes drilled .....	2, 205
Linear feet of holes drilled .....	6, 941
Number of holes blasted .....	1, 808
Linear feet of holes blasted .....	6, 055½
Number of blasts made .....	26
Number of exploders used .....	1, 822
Pounds of 75 per cent dynamite used .....	4, 375
Cubic yards of rock disrupted .....	3, 173½

Two new mud scows, built under contract by the Monongahela River Consolidated Coal and Coke Company for this work, were received December 23, 1902, and a new 80-horsepower boiler, built under contract by the Chas. Hegewald Company, was received January 27, 1903, and set up on compressor scow No. 2.

The items and quantities of work remaining to be done to complete the enlargement at the head of the canal, as proposed in the revision of the project approved April 8, 1899, are as follows:

On south side of canal:

Earth excavation .....	cubic yards..	18, 861.9
Rock to be drilled, blasted, and removed .....	do.....	4, 993.1
Old dry wall to be removed .....	do.....	434.4
Old abutment to be removed .....	do.....	1, 301.8
New wall to be built .....	do.....	3, 800.8
Paving to be done .....	square yards..	2, 365.7

In old section 3:

Rock to be drilled, blasted, and removed .....	cubic yards..	169.0
--	---------------	-------

East of former cross dam:

Rock to be drilled, blasted, and removed .....	do.....	14, 698.8
Disrupted rock to be removed .....	do.....	21, 550.8

Under and west of former cross dam:

Rock to be drilled, blasted, and removed .....	do.....	735.5
Disrupted rock to be removed .....	do.....	2, 766.5

No appropriation for the additional work for Indiana Chute, recommended in the report of a Board of Engineer Officers, approved December 30, 1901, has been made.

### *Money statement.*

July 1, 1902, balance unexpended .....	\$54, 368.55
June 30, 1903, amount expended during fiscal year .....	21, 406.09
July 1, 1903, balance unexpended .....	32, 962.46
July 1, 1903, outstanding liabilities .....	2, 347.07
July 1, 1903, balance available .....	30, 615.39

(Amount (estimated) required for completion of existing project .....	557, 569.79
Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903:	
For works of improvement .....	\$350, 000.00
For maintenance of improvement .....	5, 000.00
	355, 000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

## APPROPRIATIONS.

Enlargement at head of canal and of basin at locks:		
July 5, 1884.....	\$300,000	
August 5, 1886.....	150,000	
August 11, 1888.....	150,000	
September 19, 1890.....	60,000	
July 13, 1892.....	60,000	
August 18, 1894.....	60,000	
		\$780,000
Appropriations for improving Falls of Ohio River and Indiana Chute, Falls of Ohio River:		
June 3, 1896.....	10,000	
June 4, 1897.....	350,000	
July 1, 1898.....	152,250	
March 3, 1899.....	15,000	
June 13, 1902.....	41,000	
		568,250
Allotments for Indiana Chute from appropriations for improving Ohio River:		
July 14, 1880.....	10,000	
March 3, 1881.....	50,000	
August 2, 1882.....	35,000	
July 5, 1884.....	10,000	
August 5, 1886.....	20,000	
August 11, 1888.....	15,000	
		140,000
Appropriations for work on Indiana Chute:		
September 19, 1890.....	25,000	
July 13, 1892.....	35,000	
August 18, 1894.....	24,000	
		80,000
Total.....		1,568,250

## COMMERCIAL STATISTICS.

Commercial statistics are given in the report for operating and care of the Louisville and Portland Canal.

## J J 2.

## OPERATING AND CARE OF LOUISVILLE AND PORTLAND CANAL, KENTUCKY.

Description of original condition and references to former reports, documents, etc., will be found on page 455 of this report.

The project and estimate for the fiscal year ending June 30, 1903, approved July 30, 1902, provided as follows:

It is proposed to operate the canal and locks and to make such repairs as may from time to time become necessary to maintain them in good navigable condition; to operate the dredging outfit as needed in clearing the canal and locks of deposit, etc., brought into them by high water; to make such repairs to the towboat, dredges, buildings, walls, slopes, paving, roadways, bridges, fences, and other Government property as are necessary to maintain them in good serviceable condition.

Under this project and the estimate submitted therewith the operations during the fiscal year, in addition to the usual work of passing traffic and ordinary current repairs incident to care and preservation, were as follows:

Between stations 69 and 108 east and stations 13 east and 13 west 150,068 cubic yards mud were dredged and removed. Between stations 13 and 24 west 1,725 cubic yards rock that had been previously disrupted were removed to grade. The removal of the rock projection under the drawspan of the Louisville bridge at Fourteenth

# 1766 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

street was completed; the reconstruction of portions of the south wall at the old Ninth Street Basin, and west of the basin used by the Speed Elevator Company, was completed; two new boilers for the dredge boats were purchased and set up on those boats, to replace boilers condemned by the local boiler inspector; the hull of the towboat *Major Mackenzie* was repaired, her machinery thoroughly overhauled, and the boat repainted; plans for a new blacksmith shop were prepared and bids for building the shop opened June 24, 1903; the blocking and waterway timbers in the dry dock were renewed, and so arranged that the dock will now accommodate a boat 225 feet in length, 54 feet beam, and a total width of about 78 or 79 feet over all.

The details of the various items of work done during the fiscal year are set forth in the report of Mr. J. H. Casey, assistant engineer, appended hereto.

Following are statements of expenditures, collections, etc., for the year, together with a comparative statement of traffic and commerce passing Louisville, Ky., from 1877 to June 30, 1903:

*Summary of expenditures on account of operating and care of Louisville and Portland Canal, fiscal year 1903, showing general items and amount expended under each heading.*

Item.	Amount.
Services .....	\$59,598.57
Supplies .....	7,583.67
Materials .....	18,194.58
Miscellaneous .....	610.81
<b>Total</b> .....	<b>85,987.56</b>

## COLLECTIONS.

1902.	
July 14. Byrne & Speed Coal Company, for use of dredging plant.....	\$159.38
Sept. 17. Speed Elevator Company, for rent of land.....	125.00
Dec. 1. Auction sale of condemned property.....	253.40
Dec. 29. Louisville and Evansville Mail Company, for use of dry dock.....	88.33
1903.	
Jan. 9. Louisville Cement Company, for rent of land.....	30.00
Jan. 16. Union Cement and Lime Company, for rent of land .....	5.00
Mar. 24. Speed Elevator Company, for rent of land.....	125.00
May 6. Byrne & Speed Coal Company, for use of dredging plant.....	189.39
<b>Total</b> .....	<b>975.50</b>

All of the above collections were deposited to the credit of the Treasurer of the United States.

## AMOUNTS AND DATES OF APPROPRIATIONS AND ALLOTMENTS.

### Appropriations.

Act of March 3, 1881.....	\$40,562.91
---------------------------	-------------

### Allotments.

[From act of March 3, 1881.]

Fiscal year 1882 .....	\$54,105.66	Fiscal year 1884 .....	\$53,189.18
Fiscal year 1883 .....	61,333.14	Fiscal year 1885 .....	4,872.02

[From act of July 5, 1884.]

....., 1884.....	\$67,496.56	November 27, 1894.....	\$1,500.00
August 3, 1885.....	91,480.00	July 2, 1895.....	112,838.28
July 28, 1886.....	82,320.00	July 28, 1896.....	123,715.05
July 2, 1887.....	77,805.00	July 23, 1897.....	67,311.47
July 13, 1888.....	99,456.79	July 15, 1898.....	62,061.71
July 20, 1889.....	93,744.00	July 19, 1899.....	78,422.89
July 19, 1890.....	55,548.88	July 18, 1900.....	78,590.05
July 17, 1891.....	78,769.38	July 17, 1901.....	108,550.20
July 20, 1892.....	102,175.94	July 30, 1902.....	118,732.34
July 13, 1893.....	77,158.68		
September 9, 1893 .....	2,000.00	<b>Total</b> .....	<b>1,918,628.21</b>
July 11, 1894.....	114,528.08		

*Comparative statement of traffic and commerce at Louisville, Ky.*

## TRAFFIC.

Fiscal year.	Via Louisville and Portland Canal.					Via open river.					Aggregate.
	Passenger boats.	Tow-boats.	Coal boats and barges.	Miscellaneous.	Total.	Passenger boats.	Tow-boats.	Coal boats and barges.	Miscellaneous.	Total.	
	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
1877.....	795	295	2,185	164	3,439						
1878.....	895	487	3,232	158	4,772						
1879.....	804	293	1,227	258	2,582						
1880.....	862	235	2,205	416	3,718						
1881.....	1,088	407	2,559	142	4,196	272	325	1,126		1,723	5,919
1882.....	617	610	2,545	192	3,964	376	491	1,166	10	2,543	6,507
1883.....	1,069	769	2,784	329	4,954	256	239	935	45	1,475	6,429
1884.....	754	645	2,663	284	4,346	221	242	1,219	3	1,685	6,031
1885.....	742	772	3,086	386	4,986	116	136	551		803	5,789
1886.....	774	856	3,016	414	5,057	172	330	1,166	1	1,669	6,726
1887.....	700	847	2,904	318	4,769	354	555	1,551		2,460	7,229
1888.....	850	937	3,293	391	5,471	261	385	1,229		1,875	7,346
1889.....	1,076	767	4,632	363	6,838	502	113	880		995	7,833
1890.....	504	629	2,395	412	3,940	688	914	2,456		4,058	7,998
1891.....	590	836	3,197	254	4,877	534	513	1,619		2,666	7,543
1892.....	605	1,008	4,065	352	6,029	344	469	1,097		1,910	7,939
1893.....	573	786	1,926	499	3,784	228	502	986		1,716	5,500
1894.....	744	871	3,635	603	5,853	136	100	242		478	6,331
1895.....	622	636	2,124	673	3,955	103	248	586	5	942	4,897
1896.....	650	758	2,930	621	4,969	125	267	560	2	954	5,923
1897.....	675	732	2,658	641	4,706	309	591	1,365	30	2,295	7,001
1898.....	587	879	2,851	726	5,043	171	434	933	67	1,605	6,648
1899.....	562	854	2,799	873	5,088	216	665	1,452	132	2,465	7,553
1900.....	694	988	3,256	785	5,723	94	201	366	86	747	6,470
1901.....	613	948	3,287	733	5,581	184	620	1,543	109	2,456	8,037
1902.....	600	788	2,463	891	4,742	132	638	987	127	1,884	6,626
1903.....	507	863	3,052	657	5,079	210	815	1,553	65	2,643	7,722

## COMMERCE.

Fiscal year.	Via Louisville and Portland Canal.			Via open river.			Aggregate.
	Coal.	Other freight.	Total.	Coal.	Other freight.	Total.	
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
1881.....	551,555	56,120	607,675	553,717	8,550	562,267	1,169,942
1882.....	431,224	37,328	468,552	704,210	22,998	727,208	1,196,760
1883.....	657,829	17,294	675,123	507,452	11,588	519,040	1,194,163
1884.....	460,787	57,762	518,549	692,778	8,750	701,528	1,220,077
1885.....	928,038	23,034	951,072	223,174	1,200	224,374	1,175,446
1886.....	729,543	25,176	754,719	619,704	7,600	627,304	1,382,023
1887.....	987,330	151,894	1,139,224	716,486	30,770	747,256	1,886,480
1888.....	1,216,458	332,294	1,548,752	407,390	37,269	444,659	1,993,411
1889.....	2,137,923	503,958	2,641,881	105,868	23,837	129,705	2,771,586
1890.....	391,757	226,303	618,060	1,016,198	118,678	1,134,876	1,752,936
1891.....	1,005,796	2,938,751	3,944,547	677,342	69,895	747,237	4,691,784
1892.....	1,232,998	387,588	1,620,586	482,310	69,765	552,075	2,172,661
1893.....	344,412	193,052	537,464	482,464	63,089	545,553	1,083,017
1894.....	1,153,577	245,290	1,398,777	134,748	9,842	144,590	1,543,367
1895.....	569,921	160,735	730,656	382,014	24,812	406,826	1,137,482
1896.....	1,006,707	291,611	1,298,318	390,260	35,834	426,094	1,724,412
1897.....	813,661	272,144	1,085,805	730,645	89,254	819,899	1,905,704
1898.....	852,450	262,542	1,114,992	501,937	43,756	545,693	1,660,685
1899.....	741,898	236,323	978,221	763,844	94,987	858,831	1,837,052
1900.....	1,027,616	299,101	1,326,717	238,458	23,530	261,988	1,588,705
1901.....	937,743	279,163	1,216,906	905,037	100,740	1,005,777	2,222,683
1902.....	489,627	358,083	847,710	530,320	94,515	624,835	1,472,545
1903.....	768,804	224,095	992,898	934,648	108,881	1,043,529	2,036,427

REPORT OF MR. J. H. CASEY, ASSISTANT ENGINEER.

UNITED STATES ENGINEER OFFICE,  
LOUISVILLE AND PORTLAND CANAL,  
Louisville, Ky., July 10, 1903.

MAJOR: I have the honor to submit the following report of operations for operating and care of Louisville and Portland Canal during the fiscal year ending June 30, 1903.

# 1768 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

The canal was open to navigation during the year 299 days and closed 66 days—9 days in December, 1902, 20 days in February, 25 days in March, and 12 days in April, 1903, on account of high water. From January 12 to 15, 1903, navigation was practically suspended on account of ice in the river. The canal was used by our floating plant and by private boats as an ice harbor.

The highest stage of water during the year occurred March 9, 1903, when the upper gauge read 28.7, and the lower gauge 54.3 feet; the lowest stage was on September 8 and 9, 1902, when the upper gauge read 2.7, and the lower gauge 3.9 and 3.8 feet.

The Boulé dam at the head of the canal was raised between July 31 and August 2, 1902, May 9 and 11, 1903, one section June 5, and lowered the day following, and June 8 to 12, 1903; was lowered December 3, 1902, and June 6, 1903.

The Kentucky Chute, Boulé dam, was raised between September 8 and 11, November 12 and 14, 1902; was lowered between October 6 and 8, and on November 25, 1902.

The lock force, in addition to passing boats through the canal, put up new smoke stack at middle engine house, north side of locks; painted stacks and roofs of engine houses; whitewashed inside of buildings; repaired suspension chain at upper gate, north side of locks; replaced rotten pillow block bearings under chain drums on north and south side of locks at upper gates; replaced old wrought-iron water pipe with new cast-iron pipe from rear of residence to middle engine house, north side of locks; removed dead trees from grounds and planted 152 trees received from the board of park commissioners of the city of Louisville, Ky.; cared for property during high water, washed mud from walls, revetments, etc., and operated the automatic gate 327½ hours.

The regular employees in machine, blacksmith, and carpenter shops did all of the repair work necessary to be done to the boats; made repairs to Government boats used for "Improving Ohio River Falls near Louisville, Ky.," Wabash and White rivers, and also some repair work for Kentucky River works.

The following tables show the quantity and kind of traffic and commerce passed through the canal and over the "falls" during the year:

## COMMERCIAL STATISTICS.

*Statement of vessels passed through the Louisville and Portland Canal during the fiscal year ending June 30, 1903.*

Vessels.	Number.	Tonnage.
Passenger boats.....	507	170, 876
Towboats.....	863	126, 013
Government boats.....	354	26, 790
Coal boats and barges.....	3, 062	877, 135
Small craft.....	296	1, 439
Rafts.....	5	310
Total.....	5, 079	1, 202, 563

Total number of lockages during the year, 2,240.

*Statement of commerce passed through the Louisville and Portland Canal during the fiscal year ended June 30, 1903.*

Articles.	Tons.	Articles.	Tons.
Coal.....	768, 803½	Straw.....	2, 343½
Corn.....	917	Cattle.....	1, 388
Wheat.....	4, 426½	Sheep and swine.....	1, 621½
Salt.....	3, 522	Horses and mules.....	263½
Oil.....	652½	Lumber.....	74, 088½
Whisky.....	883½	Staves and shingles.....	7, 319½
Flour.....	293½	Steel rails.....	41, 380
Sugar.....	974½	Iron ore and manufactured iron.....	9, 490
Molasses.....	5, 319½	Produce.....	5, 557
Cement.....	2, 848½	Miscellaneous.....	55, 705½
Tobacco.....	1, 983½		
Cotton.....	1, 687½	Total.....	992, 897½
Hay.....	2, 280		

Number of passengers, 13,440.

*Statement of vessels passing Falls of Ohio River via Louisville and Portland Canal and Indiana chute from July 1, 1881, to June 30, 1903.*

Kind of vessel.	1881-1902, inclusive.		1903.		Total for 22 years.	
	Number.	Tons.	Number.	Tons.	Number.	Tons.
Passenger boats.....	20, 123	7, 973, 072	717	258, 960	20, 840	8, 232, 032
Towboats.....	25, 359	3, 404, 742	1, 678	235, 467	27, 037	3, 640, 209
Government boats.....	5, 278	347, 576	369	28, 050	5, 647	375, 626
Coal boats and barges.....	85, 398	26, 939, 509	4, 605	1, 478, 674	90, 003	28, 418, 183
Small craft.....	6, 006	8, 950	346	8, 329	6, 352	12, 279
Rafts.....	• 92	6, 220	7	590	99	6, 810
Total.....	142, 256	38, 680, 069	7, 722	2, 005, 070	149, 978	40, 685, 139

Annual average during the past twenty-two years: Boats, 6,817; tons, 1,849,324.

*Statement of commerce passing Falls of Ohio River via Louisville and Portland Canal and Indiana chute during fiscal years 1886 to 1903.*

Articles.	1886-1902, inclusive.	Fiscal year 1903.	Total for 17 years.
Coal.....	23, 385, 189½	1, 703, 451½	25, 088, 639½
Salt.....	130, 124	3, 855	133, 979
Oil.....	62, 156½	1, 066½	63, 223
Whisky.....	22, 559½	1, 193½	23, 753
Tobacco.....	91, 975½	2, 512½	94, 488
Cotton.....	142, 512½	1, 284½	143, 797½
Lumber.....	3, 486, 326½	91, 289	3, 577, 615½
Corn and wheat.....	157, 554½	6, 284½	163, 839½
Iron ore and manufactured iron.....	553, 277	32, 173	585, 450
Steel rails.....	868, 198	74, 591	942, 789
Produce.....	89, 280½	5, 670½	94, 951½
Hay and straw.....	204, 747½	7, 151½	211, 899
Flour.....	20, 341	560½	20, 901½
Stock.....	103, 187½	4, 604½	107, 792
Sugar and molasses.....	136, 769½	7, 631½	144, 401½
Staves and shingles.....	509, 716½	11, 765½	521, 482½
Cement.....	41, 404½	3, 056½	44, 461½
Miscellaneous.....	1, 389, 070½	78, 328	1, 467, 398½
Total.....	31, 394, 368½	2, 036, 427½	33, 430, 796

TOWBOAT AND DREDGES.

The towboat *Major Mackenzie* was engaged in towing scows for dredges working in canal, channel below locks, and barges, etc., on work of "Improving Ohio River, Falls near Louisville, Ky.," was laid up for repairs to hull and machinery from October 29 to December 8, 1902; on account of high water February 5 to 12, 17 to 23, March 3 to 18, 1903, and on account of repairs to crank April 3 and June 6, 1903.

Steamer *Col. G. L. Gillespie* returned from Kentucky River August 13 and was laid up until October 30, 1902, when she was put in commission to take the place of the steamer *Major Mackenzie* while the latter was being repaired; continued working to December 8, 1902, when she was laid up, remaining out of commission until June 16, 1903, when she left for Wabash River to tow dredge *Louisville No. 2* and two mud scows to Louisville; returned June 23. Out of commission from June 24 to 30, inclusive.

Dredge *Louisville No. 1* worked in canal east and west of guard gates dredging mud; also dredging disrupted rock from channel below locks, and from piers at Fourteenth street, and at head of canal for Falls of Ohio River. In April, 1903, dredged basin for Byrne & Speed Coal Company. Was laid up on account of repairs to machinery, etc., twenty-five days, and sixty-nine days on account of ice and high water and receiving new boiler.

	Cubic yards.
Quantity of mud dredged from canal.....	66, 685
Quantity of mud dredged from basin used by Speed Elevator Company.....	3, 760
Quantity of rock dredged from channel below locks.....	1, 705
Quantity of rock dredged from piers at Fourteenth street.....	280

Total quantity dredged..... 72, 430

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Dredge *Louisville No. 2* was employed in canal east and west of guard gates dredging mud; in dredging mud from basin used by Speed Elevator Company; in dredging a small quantity of rock north of the buoys between stations 98 and 112, and at work for Falls of Ohio River. On April 23 left for Wabash River, returning on June 23, 1903. Was laid up on account of repairs thirteen days; on account of ice and high water forty-nine days; and one day getting ready for trip to Wabash River.

	Cubic yards.
Quantity of mud dredged from canal .....	32, 290
Quantity of mud dredged from basin used by Speed Elevator Company .....	955
Quantity of rock dredged north of buoys.....	84

Total quantity dredged ..... 33, 329

Dredge *Wabash* dredged mud from canal east and west of guard gates; removed mud from basin used by Speed Elevator Company, and dredged rock for Falls of Ohio River. Was laid up twenty-six days on account of repairs and eighty-one days on account of ice and high water.

	Cubic yards.
Quantity of mud dredged from canal .....	44, 774
Quantity of mud dredged from basin used by Speed Elevator Company.....	1, 260

Total quantity dredged ..... 46, 034

## EXTRA LABOR.

The work done under this head was cutting grass from slopes, trimming hedge along canal bank from Fourteenth to Twenty-eighth streets, planting new check posts east of Twenty-eighth Street Bridge, resetting stone at Varble chute, lowering and raising Boulé dams, whitewashing inside of buildings, removing drift from north wall between stations 75 and 97, moving old warehouse and fitting up same as a temporary blacksmith shop, and watching and caring for floating plant.

## REMOVING DISRUPTED ROCK, CHANNEL BELOW LOCKS.

This work consisted of the removal, with dredges, of disrupted rock that had been previously blasted in the channel immediately below the locks. Dredge *Louisville No. 1* worked day and night from September 10 to October 14, 1902, and dredge *Louisville No. 2* was employed on October 13 and 14; both dredges removed 1,705 cubic yards rock, scow measure, which completed the removal of all disrupted rock above grade from the south channel line to the north line of lock extended.

## REMOVING PROJECTING ROCK UNDER DRAW SPAN, LOUISVILLE BRIDGE.

At the close of last fiscal year there remained to be drilled and blasted about 50 feet east of the bridge. On August 21 commenced blasting, continuing to the 26th, when all of the rock was disrupted. On August 25 two steam drills were operated. From August 26 to 28 dredge *Louisville No. 1* dredged the disrupted rock, removing 280 cubic yards, scow measure.

Quantities of work done were as follows:

Number of holes drilled.....	10
Linear feet drilled.....	55
Number of blasts made .....	13
Number of holes fired.....	69
Number of cubic yards solid rock disrupted .....	140

## COMPLETING WALL AT NINTH STREET.

With the exception of placing coping stone, this wall was completed during last fiscal year. Fifty-five cubic yards rock were quarried from dry dock during August, 1902, and stored on canal bank to be used as backing. On September 1 began to lay coping stone, completing same September 9, 1902. Between September 22 and 26, 1902, finished the concrete work back of coping. The pointing of the wall was completed October 4, 1902. On account of a slight settling of the crib under the wall it was necessary to trim 300 square feet of the face of the wall previously built.

	Cubic yards.
Quantity of stone masonry laid.....	45. 4
Quantity of concrete placed .....	37. 24

## WALL AT FOURTEENTH STREET.

This work, which was commenced last year, consisted of the completion of the south canal wall west of the basin used by the Speed Elevator Company. Tearing out old wall preparatory to building the new wall was commenced September 4; work of laying stone was commenced on the 6th and continued to September 30, 1902, when the wall was completed.

	Cubic yards.
Quantity of stone masonry laid.....	206.8
Quantity of concrete placed.....	32.7
Quantity of old wall removed.....	90.3

## TWO NEW BOILERS.

These boilers were to replace condemned boilers on dredges Nos. 1 and 2. A contract was entered into with Charles Hegewald Company, of New Albany, Ind., October 27, 1902, to build the boilers and deliver them on the canal wall near the dry dock for prices as follows: Dredge *Louisville No. 1*, \$660; dredge *Louisville No. 2*, \$630. The boilers were delivered December 24, 1902, and the work of setting them up in place on the boats was done by the canal-shop employees. Boiler on dredge *Louisville No. 1* was inspected by the United States local inspectors January 17, and boiler on dredge *Louisville No. 2* was inspected February 5, 1903, and both boilers found to conform to the requirements of the specifications.

## PARTLY REBUILDING HULL OF TOWBOAT.

The bow of steamer *Major Mackenzie* was very much decayed and required a new stem and framework for about 30 feet. The delivery of lumber for making the repairs was completed during September, and the work of dressing same was done at the canal shops. The boat was placed on the dry dock October 30, where all of the old bottom and side planks were torn off and new timbers put on in their place; a new deck was put down; hull and deck thoroughly calked; machinery overhauled; new wheel built; the brickwork in the furnace rebuilt and the hull and inside and outside of boat painted. All the repairs were completed and the boilers inspected December 4, 1902.

## NEW CARPENTER SHOP.

Beyond making drawings for this building, nothing has been done. On account of inconvenience that would result from limited space and building a new blacksmith shop this year, it was decided to construct one building at a time.

## NEW BLACKSMITH SHOP.

This building is to replace the old wooden blacksmith shop east of the machine shop. In order to provide room for a temporary blacksmith shop it was necessary to move an old storehouse eastwardly about 60 feet; this was done May 28. On June 26 the old blacksmith shop was torn down, and from the 27th to 30th, inclusive, excavated for concrete foundation, removing 122 cubic yards of earth, which completes the excavation ready for foundation.

## NEW KEEL BILGE BLOCKS AND WATERWAY TIMBERS FOR DRY DOCK.

The new blocks take the place of those which were built and arranged for the old dry dock years before its enlargement, and which would not accommodate a boat over 145 feet in length. With the new blocks a boat not exceeding 225 feet in length, 54 feet beam, and 78 or 79 feet over all can be docked.

The delivery of timbers for making the blocks and waterways was completed during April, 1903, and the carpenters and blacksmiths were employed from time to time, as they could be spared from other work, in dressing, sawing, boring, framing, and making drift bolts.

Before placing the waterway timbers in the dock it was necessary to excavate an area of limestone rock about 100 feet wide, 75 feet long, and 6 inches deep at the head of the dry dock. This was drilled, blasted, and the rock removed from the dock, after which the timbers were bolted down with fox bolts  $1\frac{1}{4}$  inches in diameter. Seventy cubic yards of concrete were used to level up a low place on the south side near head of dock, so as to bring it up to the general level of bottom of dock. All of the blocks were placed in position and ready to receive boats on June 20, 1903.



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## COMPLETING POWER-HOUSE FLOORS, SHAFTS, TUNNEL, ETC.

As the boilers and compressor from the drill scows are not yet available, it was decided to defer this work until such time as that machinery could be spared from the boats without interfering with other work.

## MISCELLANEOUS SUPPLIES AND CONTINGENCIES.

Under this heading the necessary supplies were purchased for use in the shops, on boats, locks, etc. Two barges of coal were purchased from the Monongahela River Consolidated Coal and Coke Company and unloaded into the coal bin at the head of the old locks.

## DRY DOCK.

The dry dock was used during the year by 20 Government boats one hundred and fifty-three days and six hours and by 3 private boats thirteen days and four hours. The collections for use of the dock by private boats amounted to \$398.35.

Very respectfully, your obedient servant,

J. H. CASEY, *Assistant Engineer.*

Maj. G. McC. DERBY,  
*Corps of Engineers.*

## J J 3.

## IMPROVEMENT OF WABASH RIVER, INDIANA AND ILLINOIS.

Description of original condition, projects, object, and scope of improvement, etc., relating to the two divisions of the river may be found in Annual Reports of the Chief of Engineers for fiscal years as follows: 1896, page 2239; 1898, page 1970; 1902, page 1984; also page 457 of this report.

### (a) IMPROVEMENT BELOW VINCENNES.

The field work of making the survey of the river below Vincennes, provided for in the act of June 13, 1902, was begun November 10, 1902, at New Harmony, Ind. High water and other unfavorable conditions necessitated a suspension of the field work from December 19, 1902, to May 6, 1903, on which latter date the survey party resumed operations at Vincennes, and, working downstream, had reached Keensburg, Wabash County, Ill., at the close of the fiscal year. The distance via river from Vincennes to the mouth of Wabash River is approximately 124 miles. Of this distance 49 miles were surveyed during periods stated above and the notes covering a distance of 12 miles reduced and platted. Other expenditures during the year were in payment of part of the cost of repairing the U. S. steamer *Col. G. L. Gillespie*.

### Money statement.

July 1, 1902, balance unexpended .....	\$20,346.39
June 30, 1903, amount expended during fiscal year .....	4,479.62
July 1, 1903, balance unexpended .....	15,866.77
July 1, 1903, outstanding liabilities .....	1,355.73
July 1, 1903, balance available .....	14,511.04
Amount (estimated) required for completion of existing project .....	<sup>a</sup> 40,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903 .....	(a)
Submitted in compliance with requirements of sundry civil act of June 4, 1897.	

<sup>a</sup> This amount is the unappropriated balance of former estimate for work at New Harmony Cut-off. Estimate of amount needed is withheld until result of survey now in progress is known and new project formulated.

## APPROPRIATIONS.

June 10, 1872 .....	\$50,000.00	August 5, 1886 .....	\$60,000.00
March 3, 1873 .....	50,000.00	August 11, 1888 .....	60,000.00
June 23, 1874 .....	25,000.00	September 19, 1890 .....	60,000.00
March 3, 1875 .....	40,000.00	July 13, 1892 .....	60,000.00
August 14, 1876 .....	70,000.00	August 18, 1894 .....	15,000.00
June 18, 1878 .....	50,000.00	June 3, 1896 .....	15,000.00
March 3, 1879 .....	20,000.00	March 3, 1899 .....	15,000.00
June 14, 1880 .....	25,000.00	June 13, 1902 .....	5,000.00
March 3, 1881 .....	25,000.00		
August 2, 1882 .....	40,000.00	Total .....	715,000.00
July 5, 1884 .....	30,000.00		

## (b) IMPROVEMENT ABOVE VINCENNES.

No work was in progress on this section of the river during the year. Expenditures made were in payment of part of the expense of repairing the U. S. steamer *Col. G. L. Gillespie*.

The only commercial statistics available are given in the report for "Operating and Care of Lock and Dam at Grand Rapids."

*Money statement.*

July 1, 1902, balance unexpended .....	\$566.35
June 30, 1903, amount expended during fiscal year .....	304.77
July 1, 1903, balance unexpended .....	261.58

## APPROPRIATIONS.

March 3, 1881 .....	\$25,000	July 13, 1892 .....	\$5,000
August 2, 1882 .....	30,000	June 3, 1896 .....	6,000
July 5, 1884 .....	10,000	March 3, 1899 .....	4,000
August 11, 1888 .....	5,000		
September 19, 1890 .....	5,500	Total .....	95,500

## J J 4.

OPERATING AND CARE OF LOCK AND DAM AT GRAND RAPIDS,  
WABASH RIVER.

The estimate and project for the operation and care of this lock and its appurtenant structures during the fiscal year ending June 30, 1903, contained the following items:

Regular force .....	\$1,500
Repairs, supplies, etc .....	3,950
Total .....	5,450

Expenditures during the year were for payment of salary of lock tender; minor repairs to the fences about the Government property; removal of weeds, etc., from the guide cribs and lock grounds; repairs to the skiff and small flatboat used at the lock; for a small quantity of sheeting to replace pieces torn from the dam; for dredging 7,810 cubic yards deposit, etc., from the lock chamber and the upper and lower approaches thereto, and for expenses incidental to supervision and maintenance.

# 1774 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

*Summary of expenditures on account of "Operating and care of lock and dam at Grand Rapids, Wabash River, fiscal year 1903," showing general items and amount expended under each heading.*

Item.	Amount.
Services .....	\$1,510.77
Materials, supplies, etc. ....	608.75
Total .....	2,119.52

## ALLOTMENTS.

March 12, 1897 .....	\$240.00	July 10, 1901 .....	\$5,184.34
July 23, 1897 .....	1,703.25	July 29, 1902 .....	1,311.38
July 15, 1898 .....	1,451.35		
July 21, 1899 .....	9,346.16	Total .....	26,989.00
July 17, 1900 .....	7,752.52		

## COMMERCIAL STATISTICS.

*Statement of traffic and commerce passing through the lock at Grand Rapids, Wabash River, for the year ending June 30, 1903.*

Kind of boat.	Number.	Tonnage.
Passenger .....	18	204
Tow .....	64	1,677
Government .....	9	692
Barges .....	82	6,655
Small craft .....	114	195
Rafts .....	10	717
Total .....	297	10,040

Total number of lockages during past fiscal year, 157.

## Commerce.

Articles.	Tons.	Articles.	Tons.
Oats .....	144	Horses, mules, and cattle .....	64
Corn .....	1,073	Lumber .....	487
Wheat .....	185	Shingles .....	24
Oil .....	2	Manufactured iron .....	15
Flour .....	3	Miscellaneous .....	69
Beer .....	2		
Straw .....	220	Total .....	2,080

Passengers, 677.

*Comparative statement of traffic and commerce at lock at Grand Rapids, Wabash River.*

Fiscal year.	Traffic.					Com- merce.
	Steam- boats.	Barges and flats.	Rafts.	Miscel- laneous.	Total.	
	Number.	Number.	Number.	Number.	Number.	Tons.
1897 .....	60	80	27	180	297	3,749
1898 .....	46	76	31	199	352	2,574
1899 .....	45	53	82	118	248	2,417
1900 .....	49	53	36	100	238	6,419
1901 .....	62	68	25	112	267	2,364
1902 .....	48	45	14	171	278	2,448
1903 .....	91	82	10	114	297	2,080

## J J 5.

## IMPROVEMENT OF WHITE RIVER, INDIANA.

No operations under the existing project for the improvement of this river were in progress during the past fiscal year, the funds under the approved estimate being almost exhausted.

Full report of project, original condition, scope of improvement, etc., will be found in Annual Report Chief of Engineers, 1896, page 2244. Further information and references may also be found on page 460 of this report.

*Money statement.*

July 1, 1902, balance unexpended .....	\$703.82
July 1, 1903, balance unexpended .....	703.82

## APPROPRIATIONS.

March 3, 1879 .....	\$25,000	August 11, 1888 .....	\$5,000
June 14, 1880 .....	20,000	July 13, 1892 .....	5,000
March 3, 1881 .....	20,000	August 13, 1894 .....	5,000
August 2, 1882 .....	20,000	June 3, 1896 .....	2,500
July 5, 1884 .....	10,000		
August 5, 1886 .....	7,500	Total .....	120,000

## J J 6.

IMPROVEMENT OF GREEN RIVER ABOVE THE MOUTH OF BIG  
BARREN RIVER, KENTUCKY.

The river and harbor act of June 13, 1902, provided funds for the construction of the second lock (No. 6, Green River) proposed in the approved project of August 11, 1891, for the extension of slack-water navigation on this part of Green River to Mammoth Cave, Ky.

The location of the lock has been decided upon and the site for the lock and abutment of the dam surveyed, but on account of the difficulty encountered in perfecting the title to the parcels of land desired it has not been practicable to accomplish other than the office work of preparing plans and specifications with a view to advertising for bids as soon as possible after the purchase of the necessary land has been effected.

Further information and references will be found on page 461 of this report.

*Money statement.*

July 1, 1902, balance unexpended .....	\$181,019.61
June 30, 1903, amount expended during fiscal year .....	406.01
July 1, 1903, balance unexpended .....	180,613.60
July 1, 1903, outstanding liabilities .....	94.74
July 1, 1903, balance available .....	180,518.86

# 1776 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

## AMOUNTS AND DATES OF APPROPRIATIONS.

July 13, 1892.....	\$50,000.00
August 18, 1894.....	25,000.00
June 3, 1896.....	20,000.00
March 3, 1899.....	85,673.20
June 13, 1902.....	180,000.00
Total.....	360,673.20

## COMMERCIAL STATISTICS.

Commercial statistics are given in the report for "Operating and care of locks and dams on Green and Barren rivers, Kentucky."

## J J 7.

### OPERATING AND CARE OF LOCKS AND DAMS ON GREEN AND BARREN RIVERS, KENTUCKY.

The project and estimate for the fiscal year ending June 30, 1903, approved July 30, 1902, provided as follows:

It is proposed to operate the several locks and to make such repairs to them, the dams, guide cribs, dwellings, storehouses, and other Government property at the several locks as is necessary to maintain the system in good navigable condition and keep the other property in serviceable repair; in connection with which work the United States snagging and dredging outfits, consisting of a snag boat, dredge, derrick boats, and small towboat, will be operated to keep the pools, lock chambers, and entrances thereto free from deposits of mud, leaves, snags, and other obstructions brought into them by the varying stages of water. The system now comprises six locks and dams, viz, Locks and Dams Nos. 1, 2, 3, 4, and 5, Green River, and No. 1, Barren River, together with the contiguous land and buildings owned by the Government.

Under this project and the estimate submitted therewith the operations during the fiscal year, in addition to the usual work of passing traffic and minor current repairs incident to care and preservation, were, briefly summarized, as follows:

At Lock No. 1, Green River, the new steel lower gates purchased during the preceding year were set up in place, the lower miter sill and lock floor repaired, the pintles of the upper gates straightened up, and the dam backed to prevent excessive leakage.

At Lock No. 2, Green River, the repairs made were of a minor character. It had been intended to replace the old warehouse and one of the dwellings at this lock with new and substantial buildings of ample capacity. To this end proposals were twice invited for building the warehouse. On each occasion the bids received were deemed excessive and rejected, thus necessitating the construction of this building being deferred until the next fiscal year.

At Lock No. 3, Green River, the project contemplated the construction of a new warehouse similar to that proposed for Lock No. 2, but for similar reasons it was found necessary to defer its construction. The foundation of the old river crib at this lock was removed by dredging. About 250 linear feet of the lower shore guide crib that had become badly decayed was removed to pool level preparatory to its reconstruction with new timber. The broken pintle steps of both upper gates and the bonnet casting of the upper shore gate were replaced with sound ones. The dam was backed in September, 1902, to prevent excessive leakage. In January, 1903, the dam was seriously injured by drift running during a high stage of the river. As soon

as practicable an examination was made to determine the extent of damage and arrangements made to secure the necessary material for repairs with as little delay as possible.

At Lock No. 4, Green River, a number of posts were set in the upper river crib for the purpose of warding off drift, etc., from the lock during the higher stages of water. The upper shore crib was reconstructed with old timber saved from the foundation of the old river crib at Lock No. 3. A brick oil house, 14 by 16 feet, was built by hired labor after formal proposals had been invited and no bids received. Three hundred linear feet of 24-inch drainpipe were laid in the low ground between the warehouses, and a large gully filled with brush, stone, etc., to prevent further washing.

At Lock No. 5, Green River, 1,900 linear feet of plank fence were built around the additional land purchased during the previous fiscal year, and 400 cubic yards of stone placed below the dam to prevent continuance of unusual scour at that locality.

At Lock No. 1, Barren River, the dam was backed twice to prevent excessive leakage, 1,807 linear feet of plank fence was built about the reservation, a small wooden bridge was constructed across the creek between the reservation and nearest post-office, and the removal of the old lower river crib commenced.

The floating plant was employed in keeping the pools, entrances to the locks, and the lock chambers free from snags, deposit, etc., and also in assisting in the more important pieces of repair work.

During the winter season a battery of three new marine steel boilers was placed on the snag boat *Wm. Preston Dixon*, and the machinery and appliances on all of the boats, as well as the hulls, cabins, etc., thoroughly repaired and made ready for the working season of 1903.

The details of the year's operations are set forth in the report of Mr. W. S. Overstreet, master, to which attention is respectfully invited.

*Summary of expenditures on account of "Operating and care of Green and Barren rivers, Kentucky," fiscal year 1903, showing general items and amount expended under each heading.*

Item.	Amount.
Services .....	\$34,300.21
Supplies .....	1,921.33
Materials .....	13,464.43
Miscellaneous .....	596.52
Total .....	50,281.49

## COLLECTIONS.

1902.	
July 7.	Jett & Turner, for water power, Lock No. 2, Green River, Kentucky. \$50. 00
July 9.	Wm. Boulton, for water power, Lock No. 1, Barren River, Kentucky. 75. 00
1903.	
Jan. 2.	Jett & Turner, for water power, Lock No. 2, Green River, Kentucky. 50. 00
Jan. 15.	Craig Brothers, for water power, Lock No. 3, Green River, Kentucky. 75. 00
Jan. 26.	R. C. Bryant, for water power, Lock No. 2, Green River, Kentucky. 150. 00
May 23.	J. A. Williams, for reimbursement of expense of repairing damage done to river wall of Lock No. 5, Green River..... 3. 60
	403. 60

All of these collections were deposited to the credit of the Treasurer of the United States.

# 1778 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

## APPROPRIATIONS AND ALLOTMENTS.

August 11, 1888.....	\$135,000.00	September 2, 1896.....	\$77,684.35
January 4, 1889.....	167,112.00	July 23, 1897.....	57,459.61
July 20, 1889.....	139,110.00	July 15, 1898.....	70,219.75
July 17, 1890.....	53,783.47	July 22, 1899.....	67,007.65
July 16, 1891.....	77,807.26	July 17, 1900.....	69,349.64
July 15, 1892.....	46,264.26	July 10, 1901.....	43,236.82
July 15, 1893.....	49,730.88	July 30, 1902.....	105,629.33
July 13, 1894.....	25,927.23		
January 26, 1895.....	6,000.00	Total .....	1,240,402.56
July 20, 1895.....	51,080.31		

## CONTRACT IN FORCE.

1. This agreement entered into this twenty-third day of July, nineteen hundred and two, between Major E. H. Ruffner, Corps of Engineers, United States Army, of the first part, and Archibald Hollerbach and Samuel L. May, composing the firm of Hollerbach & May, all of Evansville, in the county of Vanderburgh, State of Indiana, of the second part, witnesseth, that, in conformity with the advertisement and specifications hereunto attached, which form a part of this contract, the said Major E. H. Ruffner, Corps of Engineers, United States Army, for and in behalf of the United States of America, and the said Hollerbach & May, do covenant and agree, to and with each other, as follows:

That the said Hollerbach & May, shall make repairs to Dam Number One, Green River, Kentucky, in accordance with and as required by said specifications. That for said repairs satisfactorily completed in accordance with the requirements of said specifications, and accepted thereunder by the proper agent of the United States, the United States shall pay the said Hollerbach & May for the several classes of work, as specified and described in said specifications, at rates as follows, viz:

For crib excavation, eighty (80) cents per cubic yard.

For earth excavation, fifty-five (55) cents per cubic yard.

For concrete, five dollars and ten cents (\$5.10) per cubic yard.

\* \* \* \* \*

Approved by the Acting Chief of Engineers, United States Army, August 19, 1902.

## COMMERCIAL STATISTICS.

*Statements of traffic passing the locks on Green and Barren Rivers from July 1, 1902, to June 30, 1903.*

### LOCK NO. 1, GREEN RIVER.

Kind of boat.	Number.	Tonnage.
Passenger.....	393	72,087
Tow.....	684	45,774
Government.....	3	320
Barges.....	1,403	461,754
Small craft.....	155	4,148
Rafts.....	608	.....
Total.....	3,246	564,053

Total number of lockages during past fiscal year, 2,902.

### LOCK NO. 2, GREEN RIVER.

Passenger.....	446	73,047
Tow.....	536	32,675
Government.....	33	4,738
Barges.....	1,044	389,999
Small craft.....	196	4,104
Rafts.....	408	.....
Total.....	2,663	504,563

Total number of lockages during past fiscal year, 2,580.

*Statements of traffic passing the locks on Green and Barren Rivers from July 1, 1902, to June 30, 1903—Continued.*

## LOCK NO. 3, GREEN RIVER.

Kind of boat.	Number.	Tonnage.
Passenger.....	404	72, 866
Tow.....	313	24, 331
Government.....	69	10, 488
Barges.....	707	317, 293
Small craft.....	164	1, 982
Rafts.....	278	.....
Total.....	1, 935	426, 960

Total number of lockages during past fiscal year, 2,031.

## LOCK NO. 4, GREEN RIVER.

Passenger.....	570	73, 764
Tow.....	479	34, 008
Government.....	100	15, 064
Barges.....	763	301, 739
Small craft.....	149	996
Rafts.....	111	.....
Total.....	2, 172	425, 571

Total number of lockages during past fiscal year, 2,231.

## LOCK NO. 5, GREEN RIVER.

Passenger.....	28	1, 541
Tow.....	365	23, 260
Government.....	2	30
Barges.....	465	164, 884
Small craft.....	206	2, 003
Rafts.....	59	.....
Total.....	1, 125	191, 668

Total number of lockages during past fiscal year, 1,130.

## LOCK NO. 1, BARREN RIVER.

Passenger.....	598	81, 233
Tow.....	468	27, 091
Government.....	62	9, 181
Barges.....	653	183, 383
Small craft.....	58	742
Rafts.....	13	.....
Total.....	1, 852	301, 630

Total number of lockages during past fiscal year, 1,847.

*Statements of commerce passing the locks on Green and Barren rivers from July 1, 1902, to June 30, 1903.*

## LOCK NO. 1, GREEN RIVER.

Articles.	Tons.	Articles.	Tons.
Coal.....	74, 765	Lime.....	2
Corn.....	1, 816	Hay.....	512
Wheat.....	828	Cattle.....	884
Salt.....	972	Swine and sheep.....	1, 188
Oil.....	237	Horses and mules.....	113
Whisky.....	27	Lumber.....	17, 586
Flour.....	1, 523	Timber.....	226, 966
Sugar.....	702	Staves.....	8, 486
Cord wood.....	2, 202	Shingles.....	45
Molasses.....	132	Railroad ties.....	92, 082
Cement.....	114	Hoop poles.....	658
Asphalt.....	1, 700	Produce.....	4
Stone.....	1, 700	Miscellaneous.....	20, 658
Tobacco.....	848	Total.....	457, 386
Brick.....	585		
Sand.....	51		

Number of passengers, 12,371.



# 1780 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

*Statements of commerce passing the locks on Green and Barren rivers from July 1, 1902, to June 30, 1903—Continued.*

## LOCK NO. 2, GREEN RIVER.

Articles.	Tons.	Articles.	Tons.
Coal.....	456	Stone.....	2,040
Corn.....	938	Hay.....	469
Wheat.....	324	Cattle.....	325
Salt.....	844	Swine and sheep.....	678
Oil.....	185	Horses and mules.....	83
Whisky.....	19	Lumber.....	13,520
Flour.....	1,249	Timber.....	125,723
Sugar.....	529	Staves.....	8,206
Lime.....	2	Shingles.....	25
Molasses.....	90	Railroad ties.....	82,244
Cement.....	60	Hoop poles.....	432
Sand.....	9	Produce.....	3
Asphalt.....	1,700	Miscellaneous.....	16,139
Tobacco.....	893		
Brick.....	288	Total.....	259,142

Number of passengers, 10,733.

## LOCK NO. 3, GREEN RIVER.

Coal.....	7,993	Hay.....	310
Corn.....	906	Cattle.....	257
Wheat.....	355	Swine and sheep.....	549
Salt.....	525	Horses and mules.....	141
Oil.....	237	Lumber.....	2,004
Whisky.....	8	Timber.....	67,541
Flour.....	516	Staves.....	5,562
Sugar.....	325	Shingles.....	9
Asphalt.....	1,700	Railroad ties.....	65,837
Molasses.....	45	Hoop poles.....	600
Cement.....	32	Miscellaneous.....	8,162
Stone.....	1,700		
Tobacco.....	472	Total.....	165,746

Number of passengers, 7,615.

## LOCK NO. 4, GREEN RIVER.

Coal.....	12,580	Cattle.....	57
Corn.....	1,870	Swine and sheep.....	197
Wheat.....	235	Horses and mules.....	175
Salt.....	358	Lumber.....	490
Oil.....	87	Timber.....	25,470
Whisky.....	14	Staves.....	5,698
Flour.....	498	Shingles.....	14
Sugar.....	179	Railroad ties.....	48,841
Molasses.....	20	Hoop poles.....	210
Cement.....	16	Manufactured iron.....	60
Asphalt.....	1,700	Miscellaneous.....	5,137
Stone.....	1,360		
Tobacco.....	134	Total.....	106,119
Hay.....	229		

Number of passengers, 7,762.

## LOCK NO. 5, GREEN RIVER.

Coal.....	254	Cattle.....	15
Corn.....	117	Swine and sheep.....	11
Salt.....	115	Horses and mules.....	1
Oil.....	36	Lumber.....	68
Whisky.....	4	Timber.....	13,751
Flour.....	271	Staves.....	5,532
Sugar.....	40	Railroad ties.....	32,090
Lime.....	1	Hoop poles.....	40
Molasses.....	6	Asphalt.....	5,974
Cement.....	9	Miscellaneous.....	1,064
Brick.....	5		
Hay.....	121	Total.....	59,525

Number of passengers, 728.

*Statements of commerce passing the locks on Green and Barren rivers from July 1, 1902, to June 30, 1903—Continued.*

## LOCK NO. 1, BARREN RIVER.

Articles.	Tons.	Articles.	Tons.
Coal.....	14,568	Cord wood.....	51
Corn.....	1,574	Hay.....	161
Wheat.....	159	Cattle.....	18
Salt.....	231	Swine and sheep.....	78
Oil.....	55	Horses and mules.....	165
Whisky.....	25	Lumber.....	447
Flour.....	350	Timber.....	4,289
Sugar.....	114	Staves.....	60
Asphalt.....	15,871	Shingles.....	8
Molasses.....	14	Railroad ties.....	3,725
Cement.....	8	Manufactured iron.....	12
Brick.....	45	Miscellaneous.....	5,398
Stone.....	1,194		
Tobacco.....	93	Total.....	48,738

Number of passengers, 10,433.

*Comparative statement of traffic and commerce at Green and Barren rivers, Kentucky.*

## TRAFFIC.

Fiscal year.	Lock No. 1, Green River.					Lock No. 2, Green River.					Lock No. 3, Green River.				
	Steamboats.	Barges and flats.	Rafts.	Miscellaneous.	Total.	Steamboats.	Barges and flats.	Rafts.	Miscellaneous.	Total.	Steamboats.	Barges and flats.	Rafts.	Miscellaneous.	Total.
	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
1889....	284	129	350	138	901	272	107	300	15	694	.....	.....	200	.....	200
1890....	854	386	1,079	111	2,430	776	286	768	12	1,842	.....	.....	.....	.....	.....
1891....	875	456	1,082	152	2,565	768	358	721	24	1,871	225	57	372	101	755
1892....	787	449	898	184	2,318	634	272	785	6	1,097	492	305	426	212	1,435
1893....	823	506	914	161	2,404	304	379	745	9	1,437	509	269	560	249	1,587
1894....	832	437	602	176	2,047	477	333	413	9	1,232	611	469	304	227	1,611
1895....	789	606	240	264	1,899	652	494	152	46	1,344	711	456	123	212	1,502
1896....	1,143	553	620	162	2,478	702	469	440	168	1,779	880	486	234	238	1,538
1897....	919	539	226	157	1,841	935	632	239	252	2,058	867	522	103	144	1,636
1898....	1,122	882	340	200	2,544	1,037	847	260	182	2,326	835	613	133	167	1,748
1899....	1,174	803	570	169	2,716	948	819	469	184	2,420	712	532	315	220	1,779
1900....	1,088	1,239	481	132	2,940	946	1,087	521	156	2,710	750	695	288	158	1,891
1901....	1,360	1,765	592	139	3,856	1,220	1,443	302	137	3,102	1,019	1,081	202	108	2,410
1902....	992	1,113	530	137	2,772	820	927	364	255	2,366	757	780	293	223	2,053
1903....	1,077	1,403	608	158	3,246	982	1,044	408	229	2,663	717	707	278	233	1,935

Fiscal year.	Lock No. 4, Green River.					Lock No. 5, Green River.					Lock No. 1, Barren River.				
	Steamboats.	Barges and flats.	Rafts.	Miscellaneous.	Total.	Steamboats.	Barges and flats.	Rafts.	Miscellaneous.	Total.	Steamboats.	Barges and flats.	Rafts.	Miscellaneous.	Total.
	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
1889....	115	49	41	51	256	.....	.....	.....	.....	.....	112	57	10	85	264
1890....	126	55	36	123	340	.....	.....	.....	.....	.....	23	20	8	13	64
1891....	399	141	87	134	761	.....	.....	.....	.....	.....	342	177	7	3	529
1892....	619	276	208	129	1,232	.....	.....	.....	.....	.....	555	180	36	30	801
1893....	553	333	292	144	1,332	.....	.....	.....	.....	.....	618	290	32	14	854
1894....	592	391	117	115	1,215	.....	.....	.....	.....	.....	534	347	22	42	945
1895....	866	471	54	116	1,507	.....	.....	.....	.....	.....	618	335	32	56	1,041
1896....	1,307	676	112	102	2,197	.....	.....	.....	.....	.....	859	351	15	36	1,261
1897....	1,249	820	53	53	2,175	.....	.....	.....	.....	.....	842	451	10	104	1,407
1898....	1,192	884	39	176	2,291	.....	.....	.....	.....	.....	789	553	1	86	1,429
1899....	1,073	828	159	141	2,201	.....	.....	.....	.....	.....	826	528	3	119	1,476
1900....	1,099	929	122	138	2,288	288	255	47	76	616	797	462	4	103	1,366
1901....	1,347	1,017	75	141	2,580	376	383	29	217	1,005	992	497	20	93	1,602
1902....	1,012	814	102	229	2,157	391	388	53	182	1,014	859	499	10	108	1,476
1903....	1,049	763	111	249	2,172	393	465	59	208	1,125	1,066	653	13	120	1,853

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Comparative statement of traffic and commerce at Green and Barren rivers, Kentucky—  
Continued.

## COMMERCE.

Fiscal year.	Green River.					Barren River, Lock No. 1.
	Lock No. 1.	Lock No. 2.	Lock No. 3.	Lock No. 4.	Lock No. 5.	
	Tons.	Tons.	Tons.	Tons.	Tons.	
1889						
1890						
1891						
1892						
1893						
1894						
1895						
1896						
1897						
1898	198,475	161,841	109,107	84,761		28,483
1899	257,104	184,896	84,189	43,973		43,504
1900	378,684	288,948	172,016	139,530	47,098	33,356
1901	452,522	286,744	183,512	117,054	57,058	46,445
1902	385,548	242,722	153,087	110,468	47,940	30,616
1903	457,386	259,142	165,746	106,119	59,525	48,738

List of boats plying on Green, Barren, and Rough rivers, Kentucky, during the fiscal year ending June 30, 1903.

Name of boat.	Character.	Tonnage.
Wm. Preston Dixon	United States snag boat	200
Emerald	United States towboat	15
Park City	Passenger boat	196
Crescent City	do	194
J. C. Kerr	do	125
Liberty	do	68
Charles Curlin	do	58
Louise	do	48
Percy L.	do	13
Little Ben	do	13
Kalista	do	9
Water Lily	do	9
Jack Osburn	Tow	125
Pilot	do	118
Peter Hontz	do	100
Mary Lacy	do	97
E. T. Slider	do	96
Longfellow	do	94
J. M. Howell	do	94
L. H. Buhrman	do	80
Neptune	do	80
Kenols	do	69
D. A. Nisbet	do	85
Old Reliable	do	64
Emma	do	58
Fawn	do	48
Samuel	do	48
Alma	do	42
J. B. Horton	do	36
White Dove	do	15
Laura	do	13
Mystic	do	9
Rose	do	9
Levin	do	7
Jessie	do	7
R. P. Hobson	do	7
R. Nash	do	6
Agnes	do	4
Leonette	do	3
Alice L. Barr	Tug	50
J. B. A.	do	50
Louise	do	41
Edgar	do	39
Inglealde	do	36
Alfred Hennen	do	31
Lydia Wheeler	do	8
Three Brothers	Freight	58
N. Bennett	Sawmill	72
Ramona	Pleasure	12

*List of boats plying on Green, Barren, and Rough rivers, Kentucky, during the fiscal year ending June 30, 1903—Continued.*

Name of boat.	Character.	Tonnage.
Nannette .....	Pleasure.....	9
"O" .....	do .....	8
Stella .....	do .....	4
Sweetheart .....	do .....	3
Wava .....	do .....	2
Tad .....	do .....	2
Idlewild .....	do .....	1
Little Dago .....	do .....	1
Two boats, gasoline, no names .....	do .....	2

## REPORT OF MR. W. S. OVERSTREET, MASTER.

UNITED STATES ENGINEER OFFICE,  
Woodbury, Ky., July 2, 1903.

MAJOR: I have the honor to submit the following report of work pertaining to the operating and care, etc., of Green and Barren rivers, Kentucky, for the fiscal year ending June 30, 1903.

## LOCK NO. 1, GREEN RIVE

*Upper gates.*—The upper gates were raised out of place and the pintles reset, they having become canted, thereby causing the gates to be hard to open and close. Minor repairs were made to the wicket valves of these gates in order to stop leakage. A two-inch course of sheathing was put down on the old floor between the upper breast wall and the miter sill.

*Lower gates.*—The old lower wooden gates were removed and replaced with new steel gates and iron hollow quoins. The old grillage timbers in the bottom of the chamber, which had become aged and worn by water, were covered with two courses of sheathing, one 2 inches and the other 2½ inches in thickness, all the spaces underneath and between the timbers being first filled with concrete. Previous to these repairs in the bottom of the chamber there had been considerable leakage under the lower sill. A new miter sill was put down on top of the sheathing above mentioned, each side or stick of the sill being fastened with 14 bolts 1 inch in diameter and 28 inches in length. Owing to the length of the new gates, which, after the necessary repairs were made in the bottom of the chamber, extended 8 inches above the walls, it was necessary to place an 8-inch layer of concrete on the lower end of the walls. Holes were drilled in the arms of these gates to drain them of water, which collects on their upper side when the chamber is filled. Latches were placed on the new spars to hold the gates open. The lock was closed to navigation twenty-five days on account of this work.

*Dam.*—The dam was backed with 200 cubic yards of leaves, dredged from the upper chute at Lock No. 2, Green River, this being the second time this dam required backing during the season.

*Miscellaneous.*—The lock walls and gates were kept cleaned of snow, ice, mud, and drift; minor repairs were made to cisterns, fences, and skiff; the lock gates, gauges, flag pole, snubbing posts, and skiff were painted; the fences were whitewashed; the weeds were cut and removed from the reservation; some shade trees were replanted, and the reservation sown with blue-grass seed.

## LOCK NO. 2, GREEN RIVER.

*Miscellaneous.*—The lock walls and gates were kept cleaned of snow, ice, mud, and drift; some washed places in the bank above the lock were filled and graded; three fenders broken off the lower gates were replaced; minor repairs were made to the wall; the lock gates, gauges, flag pole, snubbing posts, bridge across the mill race, and skiff were painted; the fences and outbuildings were whitewashed; some shade trees were planted; the weeds were cut and removed from the reservation, and blue-grass seed was sown on the grounds.

The upper chute at this lock, as usual, filled up during the winter with leaves and sand, and it was necessary to put the Green River dredge to work in that chute in April, 1903. The deposit showed above the water in some places when the upper gauge registered 10 feet.

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## LOCK NO. 3, GREEN RIVER.

*Lower river crib.*—The foundation of the old lower river guide crib was dredged out. A small portion of the sound timber was saved from this old foundation, taken to Lock No. 4, and used in repairing above water the upper shore crib at that lock. The old unserviceable timber removed from the upper part of the crib was burned.

## Quantities:

Cubic yards sand, mud, and stone removed from foundation of old crib ..	1,895
Lineal feet old timber and stone removed from foundation .....	1,674

*Lower shore crib.*—The work of removing 250 lineal feet of the old lower shore crib was begun on June 1 and its removal above water was almost completed. Only 250 lineal feet of the crib will have to be removed, as the lower end will not be in the way of the new crib work to be constructed.

## Quantities:

Cubic yards earth removed from crib .....	309
Cubic yards stone removed from crib .....	801
Lineal feet timber removed from crib .....	10,115

*Gates.*—The pintle steps of both upper gates and the bonnet casting of the upper shore gate were discovered in June, 1902, to be broken. New pintle steps were purchased and a bonnet casting was obtained from an old gate lying below the lock. The lock was closed to navigation five days in August, 1902, and the broken castings removed and replaced with the sound ones.

*Dam.*—In September, 1902, it was necessary on account of excessive leakage to back this dam to prevent navigation being interfered with. One hundred and fifty cubic yards of mud, etc., dredged from the lower chute at Lock No. 4, Green River, was taken to Lock No. 3 and used for that purpose.

In January, 1903, during high water, a section about 140 feet in length of the lower side of the dam was torn away by heavy drift, the upper side of the dam remaining intact. There was during this rise an unusual amount of heavy drift. When the greater part of the drift was running, the water was at such a stage at this lock as to hold the drift in the reaction immediately below the dam. The pounding on the dam by this drift lasted about thirty-six hours. The fall over the dam at the time of the injury was about 3 feet. Steps were immediately taken to prevent further injury until repairs could be made during the low-water season, but on account of continued high water no actual repairs have so far been made. A rubblestone cofferdam was constructed during May, 1903, above the injured section of the dam in order to ascertain the extent of damage and to enable the character and method of repairs to be decided upon. The timber and other materials for the repairs contemplated have been purchased, and it is expected that the actual work of reconstruction will be begun in the early part of July, 1903.

*Dredging.*—Upon several occasions during the year after stages of high water it became necessary to employ a force of men to scrape mud, etc., from against the upper gates, and upon one occasion it was necessary to hurriedly rig a derrick boat with a grapple bucket and remove the mud from the lock chamber, the quantity taken out being 510 cubic yards.

*Miscellaneous.*—The lock walls were kept cleaned of snow, ice, mud, and drift; minor repairs were made to cisterns, wells, walks, and fences; the porches and steps of the lock houses, gauges, lock gates, flag poles, snubbing posts, and skiff were painted; the fences, outhouses, and basement walls of the dwellings were white-washed; the weeds were cut and removed from the reservation; some shade trees were planted, and some blue-grass seed sown on the grounds.

## LOCK NO. 4, GREEN RIVER.

*Upper river crib.*—Twenty-two posts were put in the upper river crib, next the lock wall. The top of each of these posts is 5 feet above the crib and about 3 feet above the lock wall. Their purpose is to ward off drift, etc., from the lock during high water. They were made from useless derrick masts, booms, and stiff legs.

Three range sticks were put across each of the two spaces between the upper river guide cribs and sheeted with 2-inch beech boards.

*Upper shore crib.*—This crib was rebuilt from the water's edge with sound timber saved from the foundation of the old river crib at Lock No. 3, Green River. The entire face of the crib was sheeted above water with old 2-inch and 2½-inch pine boards which had been on hand for several years and were useless for any other purpose. The head of the old mill race was at a point in this crib 57 feet above the

end of the lock wall. At the point of the old mill race 12 pieces of 4 by 8 inch timber were driven inside the crib, next the outside stringers, to prevent any of the crib filling washing out underneath, trouble of this kind having been experienced heretofore at this point. These 4 by 8 inch pieces were driven 4 feet below the surface of the water, hard against the slate bottom, and their tops sawed off level with the crib. The old paving was put back on the crib and the paving immediately back of the latter was taken up and made level with that of the crib.

*Drain.*—Three hundred linear feet of 24-inch drainpipe was laid, ranging in depth from 4 to 10 feet under the surface of the grounds, between the warehouses, and leading from the Woodbury side of the reservation toward the river. A wooden basin 10 feet square was constructed of heavy timber at the head of the drain and a flume 20 feet in length, of concrete cased with heavy timber, was built at the lower end, this casing being necessary to prevent injury to the drain from drift during high water. The fall in the drain from the upper to the lower end is about 7 feet.

*Oil house.*—A brick oil house 14 by 16 feet was built about 50 feet west of the blacksmith shop. A concrete floor was put in the house, the necessary shelving erected, and the oils stored therein.

*Filling gully.*—A barge load of brush cut from the banks of the river, with all the old timber taken from the upper shore crib, was filled into the gully in the low ground between the warehouses. On top of this were placed 100 cubic yards of stone which had been picked up from the banks of Barren River by the snag boat *Dixon*.

*Fencing.*—One thousand one hundred and twelve linear feet of new plank fence was constructed, replacing old fence worn out, and all the other fences were repaired.

*Miscellaneous.*—The spars of the lower gates, which were broken during the winter season, were replaced with new ones; new cast-iron plates were fitted down over the anchor bars of the lower gates; minor repairs were made to the lower shore capstan and to the roof of the main warehouse, which had been injured by a wind storm; a hole made by high water behind the paving adjoining the lock wall was filled with 45 cubic yards of earth; ditches to drain water away from the tool houses on the road were dug; a stone wall about 2 feet high was built between the tool houses to protect their foundations from injury from washes during rainstorms; a 2-inch drainpipe 54 feet long, leading from the lockman's house, was put in to drain the basement; minor repairs were made to walks; the lock gates, gauges, flag pole, snubbing posts, skiff, and steps from the road to the lockmen's cottages were painted; the lumber shed, stone portion of the lockmaster's dwelling, outhouses, and fences were whitewashed; the weeds on the reservation were cut and removed and blue grass was sown on the grounds.

#### LOCK NO. 5, GREEN RIVER.

*Miscellaneous.*—One thousand nine hundred linear feet of plank fence was built around the newly acquired land, minor repairs were made to all other fences, and all fencing whitewashed; the lock gates, gauges, flag pole, snubbing posts, and skiff were painted; minor repairs were made to walks, steps, water pipes, and cisterns; filter at lockman's house; roof of lockman's house, 137 feet of new valley being put on; plastering of lockman's house, 30 square yards of new plastering being put on; and to the upper end of the river wall, which had been slightly injured by a steamboat; the sewer pipes were cleaned, 50 feet of 2-inch drainpipe was put in leading from the lockman's house; the cisterns were cleaned; weeds on the reservation were cut and removed; some grading was done on the land back of the lock houses; trees were trimmed; shade trees were planted, and blue grass and orchard grass seed sown on the grounds. The bank below the lock was graded and sown in Bermuda grass. A hole, scoured out by the water just below the dam, was filled with 400 cubic yards of stone, which had been picked up along the banks of Green and Barren rivers.

#### LOCK NO. 1, BARREN RIVER.

*Bridge.*—A wooden bridge, 60 feet between abutments, 12 feet wide, was built across Swan Creek, which lies between the reservation and Greencastle, Ky. A public or county road running along the back part of the reservation was opened by the Warren County court. Previous to this road being opened, there was no outlet to this reservation except by river.

*Dam.*—It became necessary upon two occasions to back this dam to prevent excessive leakage interfering with navigation. Brush, mud, and stone were used in this work.

*Fencing.*—One thousand eight hundred and seven linear feet of new plank fence was built about the reservation. Where the new fence crossed low ground at the

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lower end of the reservation it was backed with stone to prevent injury from high water. Minor repairs were made to other fencing and all fences were whitewashed.

*Lower river crib.*—The removal of the old lower river crib was begun by the snag boat Dixon.

## Quantities:

Cubic yards stone removed from crib .....	1,035
Linear feet timber removed from crib .....	1,035

*Miscellaneous.*—In July, 1902, some necessary dredging was done in the upper chute and lock chamber by a derrick boat rigged with a grapple bucket, the dipper dredge being employed at that time at another point.

## Quantities:

Cubic yards material removed from upper chute .....	553
Cubic yards material removed from lock chamber .....	70

The lock gates, gauges, flag pole snubbing posts, and skiff were painted, the weeds on the reservation were cut and removed, and some blue-grass seed was sown on the grounds.

## SNAG BOAT WM. PRESTON DIXON.

The snag boat has been engaged in acting as dredge tender, in miscellaneous towing, in snagging in the pools of Green and Barren rivers, and in making inspection and other miscellaneous trips. She was also engaged in backing Dams Nos. 1 and 3, Green River, and No. 1, Barren River, having handled in this work 450 cubic yards of stone, mud, etc., and a barge load of brush; in loading and transferring to Lock No. 1, Green River, the necessary material and tools for putting in the new lower gates at that lock; in removing the old lower wooden gates at Lock No. 1, Green River, and putting in their place new steel ones; in repairing the upper gates at Lock No. 3, Green River; in loading timber at Lock No. 3 for transfer to Lock No. 4, Green River; in picking up along the banks of Barren River 140 cubic yards stone for use at Lock No. 3; in constructing a rubblestone cofferdam about 200 feet in length above the injured portion of Dam No. 3; in sheathing the upper shore crib at Lock No. 4; in filling into the gully between the warehouses at Lock No. 4 the old timber saved from the upper shore crib at this lock, a barge of brush, and 100 cubic yards of stone picked up along the banks of Barren River; in picking up 150 cubic yards of stone along the banks of Barren River and unloading this and 250 cubic yards of other stone into the scour below Dam No. 5, Green River; in building a bridge across Swan Creek just below the reservation at Lock No. 1, Barren River, and in fitting up the Green River quarter boat for the Wabash River survey party. The work accomplished is summarized as follows:

## As snag boat:

Snags removed in pool No. 1, Green River .....	160
Stumps removed in pool No. 1, Green River .....	1
Overhanging trees removed in pool No. 1, Green River .....	1
Snags removed in pool No. 2, Green River .....	144
Snags removed in pool No. 3, Green River .....	239
Snags removed in pool No. 4, Green River .....	175
Overhanging trees removed in pool No. 4, Green River .....	72
Snags removed in pool No. 5, Green River .....	8
Overhanging trees removed in pool No. 5, Green River .....	1
Snags removed in pool No. 1, Barren River .....	68
Overhanging trees removed in pool No. 1, Barren River .....	4
Snags removed in pool No. 2, Barren River .....	20
Overhanging trees deadened in pool No. 5, Green River .....	190
Miles run as snag boat .....	1,377

## As towboat:

Barges towed .....	33
Derrick boats towed .....	24
Dredges towed .....	7
Quarter boats towed .....	3
Scows towed .....	12
Miles run as towboat .....	1,578

## As dredge tender:

Scows towed .....	8
Material towed .....	650
Miles run as dredge tender .....	2

## Miscellaneous:

Trips made .....	7
Miles run in miscellaneous work .....	3, 691
Total number of miles run .....	6, 648

*Repairs.*—New wooden shears were made and erected in place of the old steel ones, which had become unserviceable, this work being done by the crew. During the winter season the necessary general repairs were made to the boat, machinery, and rigging, consisting of installing new boilers, overhauling all machinery, and, where necessary, supplying new fittings, etc., and painting the boat inside and outside.

## TOWBOAT EMERALD.

The *Emerald* has been engaged in acting as dredge tender, in miscellaneous towing, and in making inspection trips. A portion of this working season, about sixty days, she was employed on the Wabash River.

## As towboat:

Barges towed .....	18
Derrick boats towed .....	8
Dredges towed .....	3
Quarter boats towed .....	1
Scows towed .....	7
Miles run as towboat .....	1, 317

## As dredge tender:

Scows towed .....	302
Material towed .....	28, 432
Miles run as dredge tender .....	274

## Miscellaneous:

Trips made .....	3
Miles run in miscellaneous work .....	313
Total number of miles run .....	4, 932

*Repairs.*—During the winter season the necessary general repairs were made to the boat, consisting of new rudders, overhauling machinery, supplying new fittings, etc., where necessary, and repainting the boat.

## DREDGE NO. 1, GREEN RIVER.

The dredge was engaged in removing the foundation of the lower river crib at Lock No. 3, Green River; in blasting and removing some large rock just below Honakers Ferry, in Green River; in dredging the chutes at the various locks in Green and Barren rivers, and in dredging the channels of Green and Barren rivers at various points. A synopsis of the work accomplished follows:

## Lock No. 2, Green River:

Cubic yards sand, mud, etc., removed from upper chute .....	10, 805
Cubic yards sand, mud, etc., removed from lower chute .....	9, 917
Cubic yards sand, mud, etc., removed from lock chamber .....	190

## Lock No. 3, Green River:

Linear feet old timber removed from old crib .....	1, 674
Cubic yards stone, mud, etc., removed from old crib .....	1, 875
Cubic yards mud, etc., removed from upper chute .....	2, 015
Cubic yards mud, etc., removed from lower chute .....	1, 075

## Lock No. 4, Green River:

Cubic yards mud, etc., removed from upper chute .....	6, 960
Cubic yards mud, etc., removed from lower chute .....	940

## Lock No. 1, Barren River:

Cubic yards mud, etc., removed from chutes .....	320
--	-----

## Barren River:

Cubic yards sand, etc., removed from channel at Boat Island .....	1, 560
Cubic yards sand, etc., removed from channel at Robinsons Island .....	2, 440
Cubic yards sand, etc., removed from channel at Stephens Island .....	1, 300
Cubic yards sand, etc., removed from channel at Big Eddy .....	1, 440
Cubic yards sand, etc., removed from channel at Cow Ford .....	420
Cubic yards sand, etc., removed from channel at Bowling Green .....	925

## Green River:

Cubic yards sand, etc., removed from channel, bar above Edgars .....	760
Cubic yards sand, etc., removed from channel, foot Honaker's field .....	225

Total material dredged during year .....

cubic yards.. 42, 202



# 1788 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

*Repairs.*—During the winter season the necessary general repairs were made, consisting of overhauling machinery and rigging, supplying necessary new fittings, and painting the boat.

Very respectfully, your obedient servant,

W. S. OVERSTREET, *Master.*

Maj. G. McC. DERBY,  
*Corps of Engineers.*

J J 8.

## IMPROVEMENT OF ROUGH RIVER, KENTUCKY.

A complete synopsis of the projects under which the improvement of this river has progressed will be found on pages 2599 to 2602, Annual Report of the Chief of Engineers, 1899. See also page 463 of this report.

The work outlined in the existing project has been completed with the exception of snagging and removal of land slides, which class of work must be done from time to time as long as the sources of such obstructions are in existence.

Operations during the past fiscal year consisted in the clearing away of snags, stumps, fallen trees, and landslides from the mouth of the river to Hartford, Ky., the period of operations being from August 16 to November 4, 1902, and the plant used a derrick boat equipped with a clam-shell-dredging bucket and other suitable appliances. The work accomplished is summarized in the following statement:

Removed from pool below the lock:		
Snags .....	number..	99
Fallen trees .....	do.....	20
Stumps .....	do.....	3
Removed from pool above the lock:		
Snags .....	do.....	473
Fallen trees .....	do.....	10
Stumps .....	do.....	8
Landslides .....	cubic yards..	6, 178

The only work proposed under the project for the future is the removal of snags, slides, and similar obstructions from time to time, as may be required to maintain the channel in good navigable condition. The funds now available being sufficient for the present, no additional appropriation is recommended.

No contracts for this improvement are in force.

For commercial statistics see report for "Operating and care of lock and dam, Rough River, Kentucky."

### *Money statement.*

July 1, 1902, balance unexpended .....	\$3, 195. 19
June 30, 1903, amount expended during fiscal year.....	870. 30
July 1, 1903, balance unexpended .....	2, 324. 89
July 1, 1903, outstanding liabilities .....	17. 27
July 1, 1903, balance available .....	2, 307. 62

### APPROPRIATIONS.

September 19, 1890 .....	\$25, 000	June 3, 1896.....	\$43, 000
July 13, 1892.....	15, 000		
August 18, 1894.....	22, 500	Total .....	105, 500

## J J 9.

## OPERATING AND CARE OF LOCK AND DAM ON ROUGH RIVER, KENTUCKY.

The estimate and project for the operation and care of this lock and its appurtenant structures during the fiscal year ending June 30, 1903, contained the following items:

Regular force .....	\$750
Repairs, supplies, etc.....	550
Total .....	1,300

Expenditures during the year were for payment of salary of lock tender, messenger service between the lock and nearest post-office, and minor incidental repairs and expenses.

*Summary of expenditures on account of operating and care of Rough River, Kentucky, fiscal year 1903, showing general items and amount expended under each heading.*

Item.	Amount.
Services .....	\$799.58
Materials, etc.....	44.20
Total .....	843.78

## ALLOTMENTS.

July 23, 1897.....	\$2,086.00	July 10, 1901.....	763.66
July 9, 1898.....	1,173.92	August 5, 1902 .....	1,079.62
July 22, 1899.....	714.97		
July 17, 1900.....	686.31	Total .....	6,504.48

## COMMERCIAL STATISTICS.

*Statement of traffic passing Lock No. 1, Rough River, Kentucky, from July 1, 1902, to June 30, 1903.*

Kind of boat, etc.	Number.	Tonnage.
Passenger .....	24	265
Tow .....	104	3,430
Government .....	4	258
Barges .....	76	24,827
Small craft.....	231	189
Rafts.....	133	.....
Total.....	572	28,964

Total number of lockages during past fiscal year, 761.

# 1790 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

*Statement of commerce passing Lock No. 1, Rough River, Kentucky, from July 1, 1902, to June 30, 1903.*

Articles.	Tons.	Articles.	Tons.
Corn .....	56	Lumber .....	747
Wheat .....	136	Timber .....	29,547
Salt .....	2	Railroad ties .....	2,248
Oil .....	1	Miscellaneous .....	45
Flour .....	3		
Sugar .....	2	Total .....	32,919
Hay .....	32		

Number of passengers, 107.

For list of boats plying on this river, see page 1782 of this report.

*Comparative statement of traffic and commerce at Lock No. 1, Rough River, Kentucky.*

Fiscal year.	Traffic.					Com- merce.
	Steam- boats.	Barges and flats.	Rafts.	Miscella- neous.	Total.	
1891 .....						98,161
1892 .....						50,000
1893 .....						75,000
1894 .....						64,401
1895 .....						36,945
1896 .....						80,445
1897 .....						16,538
1898 .....	81	70	178	154	483	15,488
1899 .....	164	29	207	132	532	21,831
1900 .....	260	72	270	168	770	41,411
1901 .....	175	114	121	247	657	20,666
1902 .....	98	105	111	191	505	21,703
1903 .....	128	76	133	235	572	32,919

## APPENDIX K K.

### IMPROVEMENT OF RIVERS AND HARBORS ON LAKE SUPERIOR.

REPORT FOR THE FISCAL YEAR ENDING JUNE 30, 1903, WITH OTHER DOCUMENTS RELATING TO THE WORKS. OFFICERS IN CHARGE, CAPT. D. D. GAILLARD AND MAJ. LANSING H. BEACH, CORPS OF ENGINEERS.

#### IMPROVEMENTS.

- |   |   |
|---|---|
| 1. Harbor at Grand Marais, Minnesota.                     | 8. Harbor at Marquette, Michigan.   |
| 2. Harbor at Agate Bay, Minnesota.                        | 9. Harbor of refuge, Marquette Bay, Michigan.                               |
| 3. Harbor at Duluth, Minnesota, and Superior, Wisconsin.  | 10. Harbor of refuge at Grand Marais, Michigan.                             |
| 4. Harbor at Port Wing, Wisconsin.                        | 11. Removing sunken vessels or craft obstructing or endangering navigation. |
| 5. Harbor at Ashland, Wisconsin.                          |   |
| 6. Harbor at Ontonagon, Michigan.                         |   |
| 7. Waterway from Keweenaw Bay to Lake Superior, Michigan. |   |

#### HARBOR LINES.

12. Duluth Harbor, Minnesota.

#### UNITED STATES ENGINEER OFFICE.

*Duluth, Minn., July 18, 1903.*

GENERAL: In Compliance with General Orders, No. 5, Headquarters Corps of Engineers, United States Army, Washington, April 21, 1903, I have the honor to transmit herewith my annual report of the works under my charge in the Duluth, Minn., district.

Very respectfully,

LANSING H. BEACH,  
*Major, Corps of Engineers.*

Brig. Gen. G. L. GILLESPIE,  
*Chief of Engineers, U. S. A.*

#### K K 1.

#### IMPROVEMENT OF HARBOR AT GRAND MARAIS, MINNESOTA.

The object of the improvement is to provide a harbor for purposes of refuge and for commerce.

For a description of the harbor and of operations prior to June 30, 1901, see Report of the Chief of Engineers, United States Army, for

# 1792 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

1901, Appendix K K 1, pages 2821, 2822, and for 1902, Appendix I I 1, pages 2001-2003.

No work was done at this harbor during the past fiscal year.

The available balance and appropriation recommended will be expended principally for repairs to breakwaters and for maintenance.

A survey of this harbor was made in August, 1902, by M. W. Lewis, junior engineer. It shows the harbor basin, dredged by the United States, to be in good condition, with least depth of 15 feet at low-water datum. It is free from shoaling.

\* \* \* \* \*

## Money statement.

July 1, 1902, balance unexpended .....	\$2, 280. 82
June 30, 1903, amount expended during fiscal year .....	204. 75
July 1, 1903, balance unexpended .....	2, 056. 07
Amount that can be profitably expended in fiscal year ending June 30, 1905, for maintenance of improvement in addition to the balance unexpended July 1, 1903 .....	
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	2, 000. 00

## ABSTRACT OF APPROPRIATIONS FOR IMPROVING HARBOR AT GRAND MARAIS, MINN.

By act of Congress—		By act of Congress—	
Approved March 1, 1879 .....	\$10, 000	Approved July 13, 1892 .....	\$10, 000
Approved June 14, 1880 .....	10, 000	Of August 18, 1894 .....	3, 000
Approved March 3, 1881 .....	20, 000	June 3, 1896 .....	3, 000
Passed August 2, 1882 .....	20, 000	March 3, 1899 .....	30, 000
Approved July 5, 1884 .....	10, 000	Approved June 13, 1902 .....	2, 000
Approved August 5, 1886 .....	10, 000	Total .....	165, 350
Passed August 11, 1888 .....	15, 000		
Approved September 19, 1890 .....	22, 350		

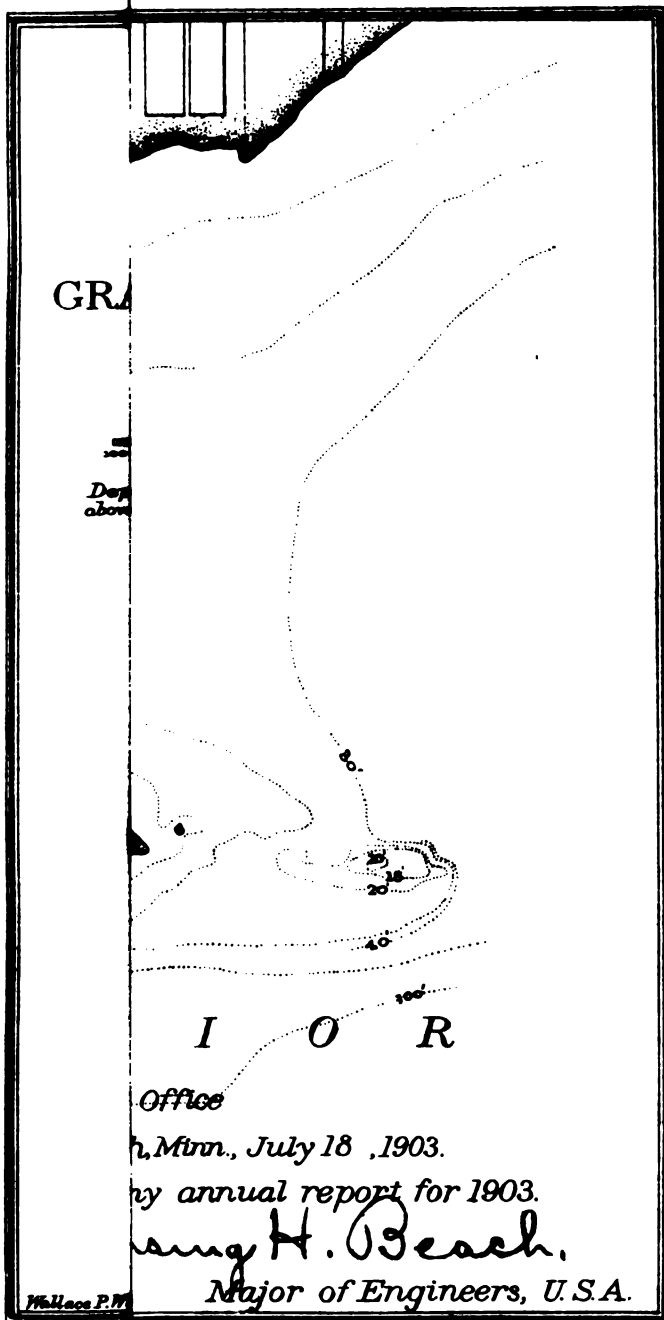
## COMMERCIAL STATISTICS.

### Arrivals and clearances of vessels at Grand Marais, Minn., for 1902.

Designation.	Arrivals.	Clearances.	Total.
Coastwise .....	245	245	490
Foreign .....	190	190	380
Total .....	435	435	870

### Freight received and shipped, 1902.

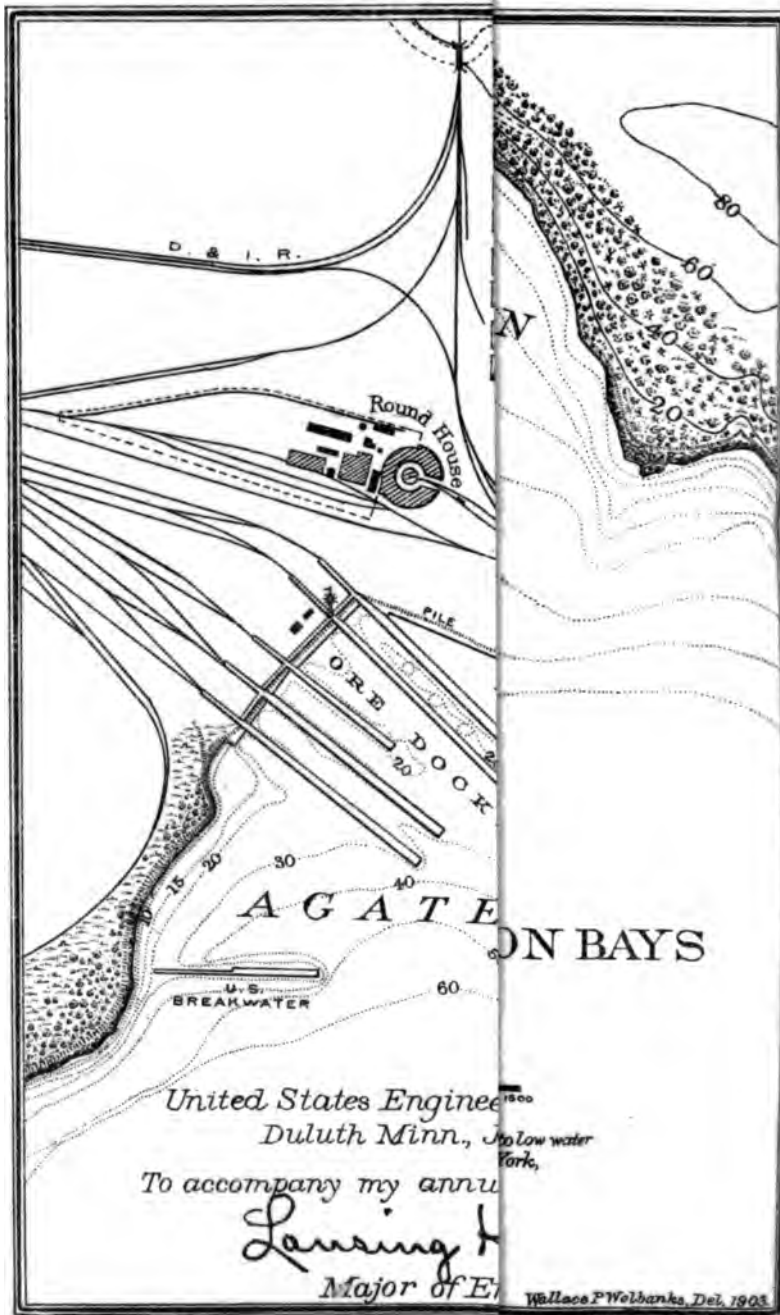
Receipts:		
Meats .....	tons of 2,000 lbs..	45
Flour and mill stuff .....	do.....	722
Grain and hay .....	do.....	426
Coal .....	do.....	42
Miscellaneous merchandise .....	do.....	716
Lumber and brick .....	do.....	659
Live stock .....	do.....	200
Engine, mill machinery, and iron .....	do.....	53
Total .....	do.....	2, 863











ANDREW B. SPARKS PHOTO LITHO WASHINGTON, D.C.

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## Shipments:

Railroad ties and telegraph poles.....	tons of 2,000 lbs..	20, 833
Lumber .....	do.....	314
Miscellaneous merchandise .....	do.....	163
Fish .....	do.....	60
Total.....	do.....	21, 370

## Passengers:

Arriving .....	number..	1, 162
Departing .....	do.....	1, 160
Total .....	do.....	2, 322
Valuation of receipts and shipments, 1902.....		\$338, 975

There are no new lines of transportation.

## K K 2.

## IMPROVEMENT OF HARBOR AT AGATE BAY, MINNESOTA.

For further details see pages 2824–2825, Appendix K K, Report of the Chief of Engineers, United States Army, 1901, and pages 2003–2005, Appendix I I 2, Report for 1902.

No work was done at this harbor by the United States during the fiscal year ending June 30, 1903.

In the matter of the suit brought by the United States attorney for the district of Minnesota in the United States district court against the Davidson Steamship Company for damage to the east breakwater, caused by the steamer *Shenandoah* in July, 1901, the first trial resulted in a verdict in favor of the United States for the full amount claimed. On an appeal taken by the defendant a new trial was had in October, 1902, which resulted in disagreement of the jury. A third trial is ordered, the hearing of which is set for November, 1903.

The available balance, together with the appropriation recommended, will be expended in repairs to the breakwaters and for maintenance.

*Money statement.*

July 1, 1902, balance unexpended .....	\$2, 185. 01
June 30, 1903, amount expended during fiscal year .....	135. 07
July 1, 1903, balance unexpended .....	2, 049. 94
{ Amount that can be profitably expended in fiscal year ending June 30, 1905, for maintenance of improvement in addition to the balance unexpended July 1, 1903.....	5, 000. 00
{ Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

## ABSTRACT OF APPROPRIATIONS FOR IMPROVING HARBOR AT AGATE BAY, MINNESOTA.

## By act of Congress—

Approved August 5, 1886....	\$22, 500
Passed August 11, 1888.....	15, 000
Approved September 19, 1890 .....	25, 000
Approved July 13, 1892....	30, 000
Of August 18, 1894.....	30, 000

## By act of Congress—

Passed June 3, 1896.....	\$50, 000
Approved March 3, 1899....	71, 708
Approved June 13, 1902....	2, 000
Total .....	246, 208

# 1794 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

## COMMERCIAL STATISTICS.

*Statement of vessels arriving and departing at Agate Bay, Minnesota, for the year 1902.*

Steam .....	2,608
Sail or tow .....	1,054
	<hr/> 3,662
Estimated tonnage .....	10,986,000
Increase .....	2,592,000

*Receipts and shipments for the year 1902.*

Ore shipped .....	tons..	6,277,338
Other freight received and shipped .....	do....	286,118
Total .....	do....	6,563,456

Beginning with 1890, amount of iron ore is stated in tons of 2,000 pounds; previous to that date, in gross tons. All other tons are of 2,000 pounds.

Estimated value of freight received and shipped, 1902, \$15,789,960.

There were no new lines of transportation established last year, but several new boats were added to the old lines.

## K K 3.

### IMPROVEMENT OF HARBOR AT DULUTH, MINNESOTA, AND SUPERIOR, WISCONSIN.

For further details, see pages 2005-2025, Appendix I I, Report of the Chief of Engineers, United States Army, 1902.

#### DREDGING UNDER CONTINUOUS CONTRACT.

Dredging operations under contracts with Messrs. Williams, Green & Williams and with Charles S. Barker were actively continued, and both contracts were fully completed before the close of the season.

The total amount of material removed during the year under these contracts was 2,175,768 cubic yards. Of this amount, 1,020,104 cubic yards have been taken out of Superior and Allouez bays, constituting dredging district No. 1; 198,435 cubic yards out of St. Louis Bay, constituting dredging district No. 2, and 957,229 cubic yards out of St. Louis River above the Northern Pacific Railway bridge at Grassy Point, constituting dredging district No. 3. Of the total amount, 942,903 cubic yards were dredged under contract with Charles S. Barker and 1,232,865 cubic yards under contract with Williams, Green & Williams. The total amount dredged under these two contracts is 21,697,243 cubic yards, of which Williams, Green & Williams have taken out 10,307,670 cubic yards and Charles S. Barker has taken out 11,389,573 cubic yards.

Work under these contracts commenced in June, 1897, and was to be completed by November 1, 1902. The contract with Charles S. Barker was completed October 31, 1902, and within the contract time. Williams, Green & Williams had been granted an extension of time and completed the work November 14, 1902.

The two dredging firms were reorganized July 1, 1902, into a single firm, the Lake Superior Contracting and Dredging Company, and after that date the work was carried on by that company under one

manager and the dredging plant was used indiscriminately on both contracts, but for the purposes of these contracts the original designations of the firms continued to be used.

\* \* \* \* \*

A detailed description of the present condition of the channels and basins of this harbor is given in Bulletin No. 13, published April 15, 1903, by the Chief of Engineers, United States Army, to supplement the information given upon the charts of the Great Lakes, pages 33-37.

The dredging operations have continued under the charge of F. L. Dever, United States assistant engineer. He was assisted by the same chief inspectors, H. H. Wadsworth, United States assistant engineer, and G. A. Taylor, United States junior engineer, and by the same corps of inspectors as in the preceding fiscal year. These gentlemen have shown much skill and energy in the direction of the work on the part of the United States.

The dredging plant used, the disposition of the dredged material, and methods of conducting the work were generally the same as in the preceding years under these contracts, for detailed description of which, together with an analysis of the results obtained with the several dredges, reference is made to the following Annual Reports of the Chief of Engineers, United States Army: For 1899, pages 2623-2632; 1900, pages 3569-3592; 1901, pages 2843-2850; 1902, pages 2017-2025.

The contract cost of dredging during the past fiscal year was \$187,105.50.

The sums paid for the entire work under the two contracts are as follows: For dredging in district No. 1, 12,239,382 cubic yards, at 7½ cents, \$917,953.65; in district No. 2, 5,168,051 yards, at 8 cents, \$413,444.08; in district No. 3, 4,289,810 yards, at 10 cents, \$428,981. Total for 21,697,243 yards, \$1,760,378.73.

Keen competition marked the bidding on the foregoing work in February, 1897, and the lowest bids—7½ cents, 8 cents, and 10 cents—for the respective districts may have been insufficient to yield a fair profit to the contractors. In fact, a considerable loss seems to have been sustained in case of one of the two firms, amounting to \$200,000, according to the statement of one of the members of the firm. Several other causes, however, contributed toward such loss or a lessening of profits: (a) A poor plant at the beginning of the work; (b) the loss of a dredge by fire; (c) a rise in prices of labor, material, and supplies, which commenced soon after the beginning of operations.

In case of the other firm the financial outcome is not known, but with a better plant at the beginning, including a hydraulic dredge, it is believed they were more successful and may have some profit to their balance.

That the work was prosecuted energetically to completion is to the credit of both firms.

In the winter of 1902-3, following the close of dredging operations, soundings were taken through the ice over all the channels and basins which have been constructed or improved under the continuous contracts and the following additional areas: Lake Superior in the vicinity of the Duluth Canal, Allouez Bay entire, the southerly portion of Superior Bay as far north as the Quebec channel, the flats of St. Louis River from Grassy Point to Spirit Lake and including this lake, and the natural channels of the St. Louis River from Grassy Point to the

foot of the rapids above Fond du Lac. Entrances to the harbor slips were also sounded. In the improved channels soundings were taken from 10 to 20 feet apart in lines 50 feet apart running across the channel, in the natural channels of the river every 40 feet on lines 200 feet apart, and over areas outside of channels 200 feet apart each way.

Some interesting figures relating to this work are given herewith. A total of 124,730 soundings were taken between dates of December 4, 1902, and March 13, 1903. Thickness of ice, 4 to 48 inches; average, 21 inches. Total thickness of ice cut through, about  $40\frac{1}{2}$  miles. Two parties were employed, each equipped with an ice-boring machine and sounding appliances. \* \* \*

The ice-boring machines are of the type built originally by James Strachan in 1892, and first used in that year on the Hay Lake survey, St. Marys River, under direction of Gen. O. M. Poe, Corps of Engineers, United States Army. It is described in the Annual Report of the Chief of Engineers, United States Army, 1893, Part IV, page 2964. An improvement in the auger was added by this office. The machine will cut a  $2\frac{1}{2}$ -inch hole through 2 feet of solid ice in about five seconds.

Under favorable conditions each party could take 300 soundings per hour through ice 24 inches thick in 23 feet of water, spaced 10 feet by 50 feet. The best record for one day of eight hours was 2,749 soundings in ice 13 inches thick and 22 feet of water.

The cost of these soundings was 3 cents each for field work alone. The soundings were laid out on the ice by transit and steel tape with accuracy and rapidity.

The results are not all mapped as yet. Fourteen sheets of the soundings 30 by 60 inches in size, scale 100 feet to the inch, have been platted, covering those channels on which work was done during the season of 1902, and copies were furnished to the United States Lake Survey office, Detroit, Mich., about June 1, 1903, for use in revising the published chart of this harbor.

These sounding sheets show the new channels to be in excellent condition, with a general depth of about 22 feet at low water datum, and no shoals or lumps that would be an obstruction to navigation. No complaints or reports have reached this office, directly or indirectly, during this season or in recent years, of vessels touching the bottom of the channel. Vessels are now loading to 19 feet 3 inches at the Missabe ore docks, St. Louis Bay, with a stage of about 1.4 feet above low-water datum, which is the greatest draft yet carried from those docks. The limiting draft is now determined by the size of the vessel and the channels below Lake Superior.

Detached surveys have been made in several localities for locating recent improvements and changes on the harbor frontage.

#### DULUTH SHIP CANAL.

The filling of the Government land adjoining the Duluth Canal on the north side with sand pumped from the harbor by a hydraulic dredge, which was commenced in June, 1902, was completed in July, 1902. The total amount of this filling was 21,375 cubic yards. The price paid for this was 20 cents per yard.

For filling the Government land south of the canal arrangements were made by which sand was discharged from the pipe of a hydraulic dredge in the process of deepening the Duluth Harbor Basin under

the continuous contract. In this way waste material was utilized for filling without cost to the United States, except a sum paid for leveling off the surface after it was deposited. The amount of this filling was about 25,000 yards, roughly estimated.

Filling between the piers of the aerial transfer bridge, under construction by the city of Duluth, on the Government lands, was paid for by the city.

After the sand filling the land was surfaced with a layer of about one-half foot of black alluvial soil, dredged from the Minnesota channel near West Duluth, under the continuous contract. By agreement with the contractors this selected material was delivered on flat scows at the Duluth Canal for 15 cents per yard. This was unloaded by hired labor and distributed by wheelbarrows at an additional cost of about 40 cents per yard. Grass seed was sown over the grounds in the spring of 1903.

Concrete sea walls and park walls inclosing the Government lands at the Duluth Canal were completed August 12, 1902; also a concrete curb or lower parapet at rear edge of each pier where it adjoins the land, for the purpose of confining the water which overtops the parapets during severe storms.

Measurements in February, 1903, showed a slight movement of the north pier toward the channel of about 0.07 feet, due to the sand filling deposited in the summer of 1902. A similar movement had previously been observed in the south pier. It may be due to the elasticity of the timber cribs, or a lateral penetration of the bearing piles into the surrounding earth. It is not a tilting, as is evident from spirit levels. The pressure of the back filling is considerable, and the small movement shows satisfactory stability. Spirit levels taken on the concrete of the north pier showed an average settlement of about 0.037 feet during a period of twelve months. On this subject see the Annual Report of the Chief of Engineers for 1901, page 2858.

#### SUPERIOR ENTRY.

In the fall of 1902 preparations were begun for the construction of new concrete piers at the Wisconsin entry, in accordance with the modified project approved by the Secretary of War August 14, 1896, and by act of Congress of June 13, 1902.

A cement warehouse 42 by 300 feet, with a capacity of 15,000 barrels, has been constructed at Superior entry, Wisconsin. A wharf 18 by 100 feet has been constructed for the use of the warehouse, and a slip 20 feet in depth, 300 feet in length, and 40 feet wide on bottom has been dredged for the same purpose. All of the foregoing work, except pile driving for wharf and dredging slip, has been performed with hired labor. Surveys have been made, reference points and concrete survey monuments established with reference to the concrete construction of the piers at Superior entry, Wisconsin. Specifications and plans were prepared for building in place the concrete south pier at Superior entry, Wisconsin, and bids for performing that work were opened on March 9, 1903. All of the bids were rejected as being too high, and the work was authorized to be performed by purchase of materials and hired labor.

The necessary detail drawings and specifications for plant, work, and materials have been made.

Eighty-eight thousand cubic yards of material have been dredged from the south pier trench, or a total of 1,250 linear feet of trench completed.

The framing for the parts of a large mold-setting traveler has been completed.

Three sets of sides for substructure molds have been framed. Loading chambers and galleries for loading pebbles into cars by gravity have been constructed. The mold-assembling platform has been graded and built. Cribbs for carrying a 10-ton derrick with engine have been constructed. The cement-testing laboratory has been moved from Duluth to the south side of the canal at Superior entry. Inspectors' quarters have been moved from the north side of the entry to the south side of same, and another United States building moved from the location of the pier trench to a point where it can be utilized as an office on the work. Ten thousand and sixty-five barrels of Portland cement have been received and stored in the United States warehouse at Superior entry, Wisconsin. Eighty thousand feet B. M. of old timber have been moved from the locality of the Duluth Ship Canal to the south side of the canal at Superior entry. One hundred and fifty thousand feet B. M. of timber was picked up on the south shore along Wisconsin Point and used in the construction of loading chambers and galleries.

A large amount of débris has been removed from the United States lands south of the canal at Superior entry by piling and burning. The general topography of these lands has been very much improved by a judicious disposition of the sand pumped from the pier trench.

Cement testing has been prosecuted on the cement received, and 1,550 briquettes have been made and 1,317 broken.

A working size model of the wedge locks to be used in locking and unlocking the subaqueous molds was made and tested under conditions which would approximate those in actual practice. The locks were found to work with ease and performed all the functions for which they were designed.

The work has been in local charge of Clarence Coleman, United States assistant engineer.

#### LAKE COMMERCE.

The system of vessel reports has been kept up which was inaugurated in 1895, and the commercial statistics accompany this report. These are as accurate as is practically possible to make them, being compiled from the individual reports of each trip of every vessel, in or out, made directly to this office.

\* \* \* \* \*

#### HARBOR LINE.

In January, 1903, an application from the owners of property on the lake shore near the base of Minnesota Point, Duluth, for permission to bulkhead and fill in certain lots to a stated distance into the lake rendered apparent the necessity for a harbor line for defining the limits of private improvements in the navigable waters of the lake in that locality. The matter was investigated by Captain Gaillard, and his recommendations reported to the Chief of Engineers under date

of January 9, 1903. After due consideration, and a hearing given to all owners of property affected, a harbor line was established by the Secretary of War April 30, 1903, extending from Duluth Ship Canal northwesterly to the mainland, a distance of 2,817 feet, and lying throughout its course parallel to and 300 feet distant from the east line of St. Croix avenue.

A more detailed description of this harbor line is given on a special map of the locality, approved by the Secretary of War, and copies of which are on file in this office.

#### PURCHASE OF LAND.

Purchase was made by the United States of a tract of land on Minnesota Point to be used as a shipyard and for the storage of property pertaining to the harbor-improvement work in this district.

The Government has for some years past been using leased property at the foot of Seventh avenue west, Duluth, where, in 1897, it built a warehouse, boathouses, and landing wharves for the Government vessels. As there was an uncertainty about the future leasing of this property, it was deemed advisable to obtain permanent quarters.

Eleven lots were purchased on the corner of Minnesota avenue and Olive street, on the bay front of Minnesota Point, about two blocks south of the Duluth Ship Canal. The area conveyed is 44,000 square feet—a portion dry land and the remainder submerged. There is a frontage of 160 feet on Minnesota avenue and riparian rights for a width of 160 feet out to the established harbor line. It is intended to remove the Government buildings from the present leased site to the newly acquired tract and to build a landing pier and a bulkhead

#### GENERAL INFORMATION.

##### WAVES. /

Observations for the investigation of waves were continued during the season of 1902 at the Duluth Canal and in the lake adjoining and at other harbors in this district. A new type of dynamometer was devised and installed by Captain Gaillard for more accurately measuring the force of wave impact and the hydrostatic pressure of rolling waves for different elevations with respect to the mean water surface. The results have been tabulated and described, together with a general discussion of the character of waves based upon all available observations, as well as upon theory, and with special reference to the effect of waves upon engineering structures. The manuscript of this work is nearly in shape for publication as a separate treatise, but was temporarily laid aside at the time of Captain Gaillard's assignment to duty on the General Staff of the Army.

##### LOCAL ATTRACTION.

In the fall of 1902 an extended series of observations for determining variation of the compass was made under the direction of this office by Mr. J. H. Darling, United States assistant engineer, over the portion of Lake Superior lying westerly of the Apostle Islands, a region that had the reputation of being subject to considerable disturbance &



# 1800 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

the compass, a number of strandings having been attributed to this cause. An allotment of \$900 was made for this work from the appropriation for surveys of the northern and northwestern lakes, a United States Navy standard compass and azimuth circle were purchased, and other instruments obtained from the office of the Chief of Engineers, and about 800 determinations of magnetic variation were made aboard the United States steamer *Vidette* by the method of sun azimuths. The results are interesting and will be of use to navigators. A full report of this work has not yet been made on account of pressure of current work, but a comprehensive summary of the results obtained is given on pages 7-10 of Bulletin No. 13, Survey of Northern and Northwestern Lakes, published April 15, 1903.

## SURVEYS.

Search was made, November 30-December 4, 1902, for a shoal said to have been struck by the steamer *Van Hise*, on October 24, 1902, near York Island of the Apostle group, Lake Superior. The examination was made by J. H. Darling, United States assistant engineer, with a small surveying party on the U. S. S. *Vidette*, and the facts developed made it evident that the *Van Hise* had struck the previously charted and well-known York Island shoal. For further details see report to the Chief of Engineers by Capt. D. D. Gaillard, dated January 9, 1903.

Attention is invited to the index maps accompanying this report, showing all harbors under improvement in this district, with condition and improvements to date, as far as possible to be shown on the small scale required. \* \* \*

## Money statement.

July 1, 1902, balance unexpended .....	\$828, 858. 10
Amount received from sales United States property .....	550. 00
	<hr/>
	829, 408. 10
June 30, 1903, amount expended during fiscal year .....	412, 590. 39
	<hr/>
July 1, 1903, balance unexpended .....	416, 817. 71
July 1, 1903, outstanding liabilities .....	15, 000. 00
	<hr/>
July 1, 1903, balance available .....	401, 817. 71
	<hr/>
July 1, 1903, amount covered by uncompleted contracts .....	165, 000. 00
	<hr/>
{ Amount (estimated) required for completion of existing project .....	520, 000. 00
{ Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903:	
For works of improvement .....	\$520, 000. 00
For maintenance of improvement .....	<sup>a</sup> 150, 000. 00
	<hr/>
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	670, 000. 00

<sup>a</sup> For dredging plant (additional).

## APPENDIX K K—REPORT OF MAJOR BEACH.

1801

ABSTRACT OF APPROPRIATIONS FOR IMPROVING HARBOR AT DULUTH, MINN., AND  
SUPERIOR, WIS.

By act of Congress of June 3, 1896.....	\$50,000.00
By sundry civil act of—	
June 4, 1897 .....	437,500.00
July 1, 1898 .....	770,138.00
March 3, 1899 .....	300,000.00
June 6, 1900 .....	793,187.50
March 3, 1901 .....	320,000.00
June 28, 1902 .....	459,727.50
Act approved June 13, 1902 .....	200,000.00
Miscellaneous receipts sale of United States property .....	550.00
Total .....	3,331,103.00

The following statement shows the manner in which the appropriations have been expended since June 30, 1896. The amount expended under the different classes of work includes the cost of soundings, superintendence, buoying, and contingencies.

Dredging .....	\$2,123,833.71
Duluth Canal piers .....	600,000.00
Wisconsin entry piers .....	83,890.39
Purchase of land .....	106,561.19
Total .....	2,914,285.29

## ABSTRACT OF APPROPRIATIONS FOR IMPROVING HARBOR AT DULUTH, MINN.

By act of congress approved—	
March 3, 1871 .....	\$60,000.00
June 10, 1872 .....	50,000.00
Allotted from act passed March 3, 1873 .....	38,049.20
By act of Congress approved—	
June 23, 1874 .....	10,000.00
March 3, 1875 .....	35,000.00
August 14, 1876 .....	15,000.00
June 18, 1878 .....	30,000.00
March 3, 1879 .....	25,000.00
June 14, 1880 .....	25,000.00
March 3, 1881 .....	40,000.00
By act of Congress passed August 2, 1882 .....	45,000.00
By act of Congress approved—	
July 5, 1884 .....	45,000.00
August 5, 1886 .....	58,250.00
By act of Congress passed August 11, 1888 .....	80,000.00
By act of Congress approved—	
September 19, 1890 .....	100,000.00
July 13, 1892 .....	125,000.00
By act of Congress of August 18, 1894 .....	75,000.00
Total .....	852,299.20

The following statement shows the manner in which the appropriations have been expended. The amount expended under the different classes of work includes the cost of soundings, superintendence, buoying, and contingencies.

Total amount expended to June 30, 1897:	
Breakwater .....	\$110,000.00
Dredging .....	644,638.55
Canal piers, etc .....	97,660.65
Total .....	852,299.20
Expended prior to present project:	
Breakwater .....	110,000.00
Canal piers, etc .....	45,698.33
Dredging .....	122,354.05
Total .....	278,052. <sup>38</sup>

## 1802 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

Expended under the project adopted in 1881:

Canal piers, etc .....	\$51,962.32
Dredging .....	522,284.50
Total .....	574,246.82

### ABSTRACT OF APPROPRIATIONS FOR IMPROVING HARBOR AT SUPERIOR BAY AND ST. LOUIS BAY, WISCONSIN.

By act of Congress approved—

March 3, 1867 .....	\$63,000.00
April 10, 1869 .....	45,000.00
July 7, 1870 .....	40,000.00
March 3, 1871 .....	60,000.00
June 10, 1872 .....	50,000.00

Allotted from act approved March 3, 1873 .....

Allotted from appropriations for "Repairs of Harbors on Northern Lakes" .....

By act of Congress approved—	
August 14, 1876 .....	3,000.00
June 18, 1878 .....	3,000.00
March 3, 1879 .....	5,000.00
June 14, 1880 .....	5,000.00
March 3, 1881 .....	10,000.00
August 2, 1882 .....	40,000.00
July 5, 1884 .....	45,000.00
August 5, 1886 .....	22,500.00

By act of Congress—

Passed August 11, 1888 .....	50,000.00
Approved September 19, 1890 .....	65,000.00
Approved July 13, 1892 .....	70,000.00
Of August 18, 1894 .....	50,000.00

Total .....

Aggregate .....

### EXPENDITURES.

Amount expended under original project, adopted in 1867 .....	\$258,000.00
Amount expended under project recommended by Board of Engineers in 1873 .....	77,513.26
Amount expended under present project to June 30, 1897 .....	360,370.54
Total .....	695,883.80

The following statement shows the manner in which the appropriations have been expended. The amount expended under the different classes of work includes the cost of examination, soundings, superintendence, buoys, and contingencies.

Repairs and beach protection .....	\$13,233.00
Construction and repair to piers .....	334,278.64
Dredging .....	348,372.16
Total .....	695,883.80

### LIST OF EXISTING CONTRACTS.

Contract was entered into with the Illinois Steel Company, of Chicago, Ill., dated January 30, 1903, approved by Chief of Engineers, February 21, 1903, for furnishing 65,000 barrels of Portland cement for Superior Entry piers, south side, at \$2.17 per barrel, delivered in sacks (four sacks to the barrel), less 10 cents each for sacks returned. Delivery to commence May 1, 1903, and be completed by September 15, 1904.

Contract was entered into with Hugo & Tims, Duluth, Minn., dated January 31, 1903, approved by Chief of Engineers February 21, 1903, for furnishing and driving piles at Superior entry, Wisconsin, at 15.7 cents per linear foot, work to commence within thirty days after opening of navigation and to be completed in six weeks' time. Time for commencement extended to August 15, 1903, and time for completion of contract correspondingly extended by authority of the Chief of Engineers, dated June 17, 1903.

Emergency contract was entered into with the Sunset Lumber Company, of Tacoma, Wash., dated June 2, 1903, for furnishing 500,000 feet B. M. of Washington or Oregon fir lumber, at \$8.90 per 1,000 feet B. M., f. o. b. cars at Washington or Oregon points. Delivery to commence promptly and to be completed by July 1, 1903. Time for completion waived for a reasonable period by indorsement of Chief of Engineers dated June 27, 1903.

Emergency contract with the H. B. Waite Lumber Company, of Minneapolis, Minn., entered into June 17, 1903, for furnishing 351,300 feet B. M. of Washington or Oregon fir lumber, at \$8.50 per 1,000 feet B. M., f. o. b. cars at Washington or Oregon points. Delivery to commence promptly and to be completed by September 1, 1903.

Contract entered into February 18, 1903, with Lake Superior Contracting and Dredging Company, of Duluth, Minn., approved by Chief of Engineers March 9, 1903, for dredging pier trench at Superior entry, Wisconsin, at 15 cents per cubic yard, work to commence within three days after condition of ice will permit movements of dredge in the spring of 1903 and be completed within forty-five days thereafter. Time for completion of contract extended thirty days by indorsement of Chief of Engineers, United States Army, dated July 3, 1903.

Contract was entered into with George A. Wieland, of Duluth, Minn., dated June 15, 1903, approved by Chief of Engineers July 9, 1903, for furnishing and delivering in stock pile at Superior entry, Wisconsin, 43,000 cubic yards of pebbles or gravel at \$1.08½ per cubic yard. Delivery to commence July 1, 1903; to continue at rate of 5,200 cubic yards per month during season of navigation, making a total of 20,800 cubic yards to be delivered during season of 1903. During season of 1904 delivery to be at rate of 5,550 cubic yards per month until 22,200 cubic yards have been delivered.

## COMMERCIAL STATISTICS, DULUTH, MINN.

*Comparative statement of arrivals and clearances for 1901 and 1902.*

Year.	Arrivals.	Clearances.	Total.	Tonnage.	Average tonnage.
1902.....	4,816	4,843	a 9,659	13,927,284	b 1,568
1901.....	4,174	4,135	c 8,309	10,375,865	b 1,451
Increase over 1901.....	642	708	1,350	3,551,419	117

a Steam, 8,459; sail, 1,200.

b Exclusive of tugs with freight.

c Steam, 6,970; sail, 1,339.

*Principal domestic commodities received and shipped by lake, 1902.*

[Tons of 2,000 pounds.]

Receipts.	Tons.	Shipments.	Tons.
Coal.....	905,915	Wheat.....	570,417
Cement and limestone.....	104,399	Other grains.....	234,354
Building stone, sand, etc.....	21,940	Flour.....	297,781
Salt, oil, etc.....	36,012	Iron ore.....	6,198,043
Manufactured iron and machinery.....	63,346	Copper.....	1,707
General merchandise and fish.....	142,267	Wool.....	2,784
Lumber.....	1,695	Lumber, shingles, and lath.....	529,756
Poles, ties, etc.....	15,783	General merchandise.....	45,496
Total.....	1,291,357	Miscellaneous.....	8,898
		Total.....	7,884,236

# 1804 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

## Principal domestic commodities received and shipped by lake, 1902—Continued.

### RECAPITULATION.

	Tons. <sup>a</sup>	Valuation. <sup>b</sup>
Total receipts .....	1,291,357	\$31,431,750
Total shipments .....	7,884,236	65,040,403
Receipts and shipments .....	9,175,593	96,512,553

<sup>a</sup> These figures do not include some 87,374,000 feet of logs in rafts.

<sup>b</sup> Valuations are based on average wholesale prices on board vessels for exports and landed on wharves for imports.

Passengers arriving .....	53,081
Passengers departing .....	55,689
Total .....	108,770

### Receipts of coal and shipments of flour eastward, 1902.

	Tons.
Coal .....	905,915
Flour .....	297,781

The storage capacity of Duluth-Superior elevator system is 34,375,000 bushels, and that of Duluth elevators proper 16,500,000 bushels.

The shipments of wheat from Duluth-Superior harbor for the year 1902 were 1,230,220 tons.

### Average vessel tonnage, 1902.

	Tons.
Duluth and Superior (exclusive of tugs) .....	1,667

### Arrivals and clearances of vessels at Duluth, 1902.

Arrived .....	4,816
Cleared .....	4,843
Total .....	9,659

### Imports and exports, 1902.

Imports .....	\$3,557,448.00
Duties .....	1,201,222.81
Value of domestic exports .....	2,351,179.00
Value of foreign exports .....	3,429,058.00

All cargo tons are of 2,000 pounds.

Number of vessels of all kinds enrolled at Duluth custom-house up to June 30, 1903, 339. Total gross registered tonnage, 493,731. Increase of 23 vessels over 1902.

### Detailed statement of arrivals, clearances, and registered tonnage of vessels through the Duluth Canal for the calendar year 1902.

Month.	Arrived.	Cleared.	Total.	Net registered tonnage.
January .....	19	21	40	6,504
February .....	5	5	10	1,682
March .....	6	9	15	10,425
April .....	305	297	602	973,547
May .....	549	514	1,063	1,480,005
June .....	615	550	1,165	1,702,276
July .....	637	652	1,289	1,734,353
August .....	678	661	1,339	1,831,284
September .....	540	508	1,048	1,563,540
October .....	545	517	1,063	1,631,499
November .....	504	442	946	1,554,629
December .....	141	94	235	374,216
Total .....	4,545	4,270	8,815	12,863,980

# APPENDIX K K—REPORT OF MAJOR BEACH.

1805

Total tons cargo received through Duluth Canal..... 2,932,590  
Total tons cargo departing through Duluth Canal..... 9,168,651

Total..... 12,101,241

Many tugs passed in and out of Duluth Canal with dump scows and many others light or with vessels in tow, which are not included in the above table.

*Freight received and shipped, Duluth-Superior combined.*

[Tons of 2,000 pounds.]

Description of cargo.	Quantity.	Unit price.	Valuation.
Cement..... barrels..	183,460	\$2.25	\$412,785
Coal:			
Hard..... tons..	290,736	6.25	1,817,100
Soft..... do.....	2,382,803	4.00	9,531,212
Copper..... do.....	35,756	250.00	8,939,000
Fish..... do.....	1,419	100.00	141,900
Flax..... bushels..	12,825,078	1.50	19,237,617
Flour..... barrels..	7,660,326	4.00	30,641,304
General merchandise..... tons..	272,904	150.00	40,935,600
Grains (exclusive of wheat and flax)..... bushels..	8,699,245	5.50	4,349,623
Hay..... tons..	89,284	12.00	3,408
Iron ore..... do.....	10,884,356	2.25	24,489,801
Limestone..... do.....	89,649	1.50	134,324
Logs..... M. feet..	136,599	12.50	1,707,488
Lumber:			
Hard wood..... do.....	702	50.00	35,100
Pine..... do.....	416,582	15.25	6,352,876
Machinery..... tons..	1,379	330.00	455,070
Manufactured iron..... do.....	115,223	65.00	7,489,495
Oils..... barrels..	114,592	7.00	802,144
Poles and piles..... number..	119,709	1.65	197,520
Posts..... do.....	25,622	1.12	3,075
Pulp wood..... cords..	5,055	5.00	25,275
Salt..... barrels..	367,409	1.60	220,445
Sand and gravel..... cubic yards..	22,110	1.00	22,110
Shingles and laths..... M..	343,827	2.75	945,524
Silver and lead..... tons..	50	78.00	3,900
Staves..... number..	463,300	4.75	2,201
Stone, building..... tons..	10,518	7.00	73,626
Ties, railroad..... number..	190,599	.40	76,240
Wheat..... bushels..	41,007,337	.74	30,345,429
Wool..... tons..	10,107	500.00	5,053,500
Total valuation.....			194,444,695

*Commerce for the head of the lakes (Duluth, Minn., and Superior, Wis., combined) for the calendar year 1902.*

[Tons of 2,000 pounds.]

Receipts.	Tons.	Shipments.	Tons.
Soft coal.....	2,379,521	Iron ore.....	10,884,356
Hard coal.....	290,736	Copper.....	35,756
Limestone.....	89,649	Flour.....	7,660,326
Salt.....	52,487	Wheat.....	1,290,220
Machinery.....	1,379	Flax.....	359,102
Manufactured iron.....	114,982	Other grains.....	217,481
Oil.....	22,907	Wool.....	10,107
General merchandise.....	210,930	Lumber.....	621,506
Lumber.....	4,667	Shingles.....	32,214
Ties and posts.....	11,230	Laths.....	5,295
Poles and piles.....	16,310	General merchandise.....	61,974
Fish.....	1,419	Iron and machinery.....	421
Cement and lime.....	36,692	Miscellaneous.....	3,596
Building stone.....	10,518		
Sand and gravel.....	29,480		
Pulp wood.....	4,802		
Miscellaneous.....	368		
Total.....	3,277,797	Total.....	14,227,996

Total tons cargo entered and departed..... <sup>a</sup> 17,505,793

Valuation..... \$194,444,695

Total arrivals and departures..... 15,866

Net registered tonnage..... 23,811,275

<sup>a</sup> Does not include 136,599,000 feet of logs in rafts.

# 1806 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

## *Arrivals and clearances of vessels at Superior, Wis., for 1902.*

Steam .....	5,321
Sail .....	886
Total .....	6,207
Arrivals and clearances (not including dump scows) which passed in and out of Wisconsin entry .....	2,935
Average net tonnage of vessels (exclusive of tugs) .....	1,766
Net tonnage .....	9,883,991

The storage capacity of Superior elevators is 17,875,000 bushels.

## *Vessel report for Superior Harbor for calendar year 1902.*

### ENTERING.

[Tons of 2,000 pounds.]

	Boats.	Net registered tonnage.	Tons of cargo.
Number which entered Superior Harbor via Duluth Canal .....	1,039	1,693,156	1,649,854
Number which entered Superior Harbor light via Duluth Canal .....	758	1,271,989	.....
Number which came in Wisconsin entry and discharged at Superior ..	214	162,946	<sup>a</sup> 336,586
Number which entered Wisconsin entry light or with rafts in tow ...	1,117	1,785,630	.....
Total .....	3,128	4,913,721	1,986,440

### DEPARTING.

	Boats.	Net registered tonnage.	Tons of cargo.
Number which took cargo from Superior and departed through Duluth Canal .....	781	1,279,522	1,410,872
Number which left Superior light and departed through Duluth Canal ..	396	411,111	.....
Number which loaded at Superior and departed through Wisconsin entry ..	1,268	2,634,393	<sup>b</sup> 4,932,888
Number which left Superior light and took cargo on at Duluth and departed via Duluth Canal .....	285	473,152	.....
Number which departed through Wisconsin entry light or with booms in tow .....	349	172,092	.....
Total .....	<sup>c</sup> 3,079	4,970,270	6,343,760

<sup>a</sup> These figures do not include 113,519,000 feet of logs towed in through the entry by tugs.

<sup>b</sup> These figures do not include 126,457 tons loaded at Duluth.

<sup>c</sup> These figures do not include tugs which passed in and out of the entry with dump scows or with vessels in tow.

## *Vessel report for Wisconsin entry for calendar year 1902.*

### ENTERING.

[Tons of 2,000 pounds.]

	Boats.	Net registered tonnage.	Tons of cargo.
Number which came through Wisconsin entry and discharged at Superior .....	214	162,946	<sup>a</sup> 336,583
Number which came through Wisconsin entry light or with rafts in tow ..	1,117	1,785,630	.....

### DEPARTING.

	Boats.	Net registered tonnage.	Tons of cargo.
Number which took cargo at Superior and departed through Wisconsin entry .....	1,268	2,634,393	<sup>b</sup> 5,069,345
Number which departed through Wisconsin entry light or with booms in tow .....	349	172,092	.....

<sup>a</sup> These figures do not include 113,519,000 feet of logs towed in through the entry by tugs.

<sup>b</sup> These figures include 126,457 tons loaded at Duluth.

# APPENDIX K K—REPORT OF MAJOR BEACH.

1807

*Receipts and shipments by lake of leading articles during the calendar year 1902, Superior Harbor.*

[Tons of 2,000 pounds.]

Receipts.	Tons.	Shipments.	Tons.
Coal.....	1,764,342	Iron ore .....	4,686,318
Building stone.....	7,269	Copper .....	33,983
Salt .....	17,599	Flour .....	468,251
Manufactured iron.....	52,683	Wheat .....	659,808
Oil, fish, etc.....	22,303	Other grains.....	342,229
General merchandise.....	70,082	Wool .....	7,823
Ties, poles, etc.....	16,559	Lumber .....	109,197
Cement, limestone.....	21,842	Shingles and lath.....	20,062
Sand, gravel, and lumber.....	13,761	General merchandise.....	16,478
		Miscellaneous .....	121
Total.....	1,986,440	Total .....	6,543,760

<sup>a</sup> Not including logs.

## RECAPITULATION.

	Freight.	Valuation.
	<i>Tons.</i>	
Total receipts.....	1,986,440	\$23,325,480
Total shipments.....	6,343,760	74,606,662
Total receipts and shipments.....	8,330,200	97,932,142

Passengers departing .....	6,374
Passengers arriving.....	6,148
Total .....	12,522

*Detailed statement of arrivals and clearances of vessels, Superior, Wis., for the calendar year 1902.*

Month.	Arrived.	Cleared.	Total.	Net registered tonnage.
March .....		7	7	18,918
April.....	176	200	376	677,496
May.....	331	335	666	1,040,911
June.....	435	428	863	1,130,108
July.....	483	477	960	1,293,371
August.....	461	445	906	1,296,441
September .....	412	415	827	1,360,255
October .....	401	394	795	1,436,425
November .....	344	328	672	1,312,815
December.....	85	50	135	318,256
Total.....	3,128	3,079	6,207	9,883,991

Average net tonnage per vessel, exclusive of tugs, 1,766.

Of the number of vessels reported for 1902 there were 5,321 steam and 886 sailing vessels. The steamers were divided as follows: 4,994 freight propellers, 227 passenger and freight combined, 265 excursion boats, and 708 tugs.

*Statement of arrivals and clearances of vessels for the year 1902.*

Number of vessels .....	6,207
Net tonnage.....	9,883,991

*New lines of transportation, Duluth-Superior, 1903.*

The Gilchrist Transportation Company, Cleveland, Ohio, instead of J. C. Gilchrist, 10 steamers building, 2 old ones added, a total of 81 vessels; D. T. Helm, agent, Duluth, Minn.



## 1808 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

The United States Transportation Company, Cleveland, Ohio, instead of W. W. Brown, 5 new steamers, a total of 12 steamers; D. T. Helm, agent, Duluth, Minn.

The Provident Steamship Company, 4 new steamers; R. M. Wolvin, manager, Duluth, Minn.

The Zenith Steamship Company, 2 steamers; G. A. Tomlinson, manager, Duluth, Minn.

C. W. Elphicke Company, Chicago, Ill., 2 steamers, D. T. Helm, agent, Duluth, Minn.

Henry Steinbrenner, Cleveland, Ohio, 2 new steamers.

### *Additions to existing lines, 1903.*

Duluth Steamship Company, 1 new steamer.

Superior Steamship Company, 1 new steamer; G. A. Tomlinson, manager, Duluth, Minn.

Great Lakes and St. Lawrence Transportation Company, 10 new steamers in place of 5 old ones last year; R. M. Wolvin, general manager, Duluth, Minn.

W. A. Hawgood & Co., 1 new steamer and more building; D. T. Helm, agent, Duluth, Minn.

Anchor Line, 2 new steamers; D. A. Christy, agent, Duluth, Minn.

### DULUTH-SUPERIOR HARBOR, CALENDAR YEAR 1902.

Total vessel freight arrived and departed, 17,505,793 tons of 2,000 pounds, valued at \$194,444,695.

Increase in freight tonnage since 1890, 515 per cent.

Increase in freight tonnage during past year, 35 per cent.

It is impossible to give precise figures of the marine commerce of the principal ports of the United States for comparison with Duluth-Superior Harbor, for the reason that at ocean ports of the United States, as well as of foreign countries, no record of domestic tonnage is kept at the custom-houses, whereas on the Great Lakes a record is kept of the total marine commerce, both foreign and domestic. In the principal ocean ports of the United States the tonnage of the local and coastwise (domestic) marine commerce is several times greater than that of the foreign.

Any comparison, therefore, of the relative marine commerce of lake and ocean ports based solely upon custom-house records is, for the reason just stated, incorrect and misleading.

From commercial statistics (published in the Report of the Chief of Engineers, U. S. Army, for 1902) furnished by boards of trade and commercial and maritime exchanges to officers of the United States Corps of Engineers in charge of improvements at the various ocean ports it would appear that, based upon annual vessel freight arriving and departing, the relative standing of the principal ports of the United States is now as follows: (1) New York, (2) Philadelphia, (3) Duluth-Superior, (4) Boston.

The navigation season for Duluth-Superior Harbor averages only about eight months per annum, while for the three ocean ports mentioned above navigation is carried on during twelve months. Considering the mean monthly freight movement during the season of navigation, Duluth-Superior Harbor stands next to New York.

### REMARKS—DULUTH-SUPERIOR HARBOR, 1902.

*Vessel tonnage.*—The net registered tonnage is given and is obtained from vessel reports made to this office, and checked by official marine directories.

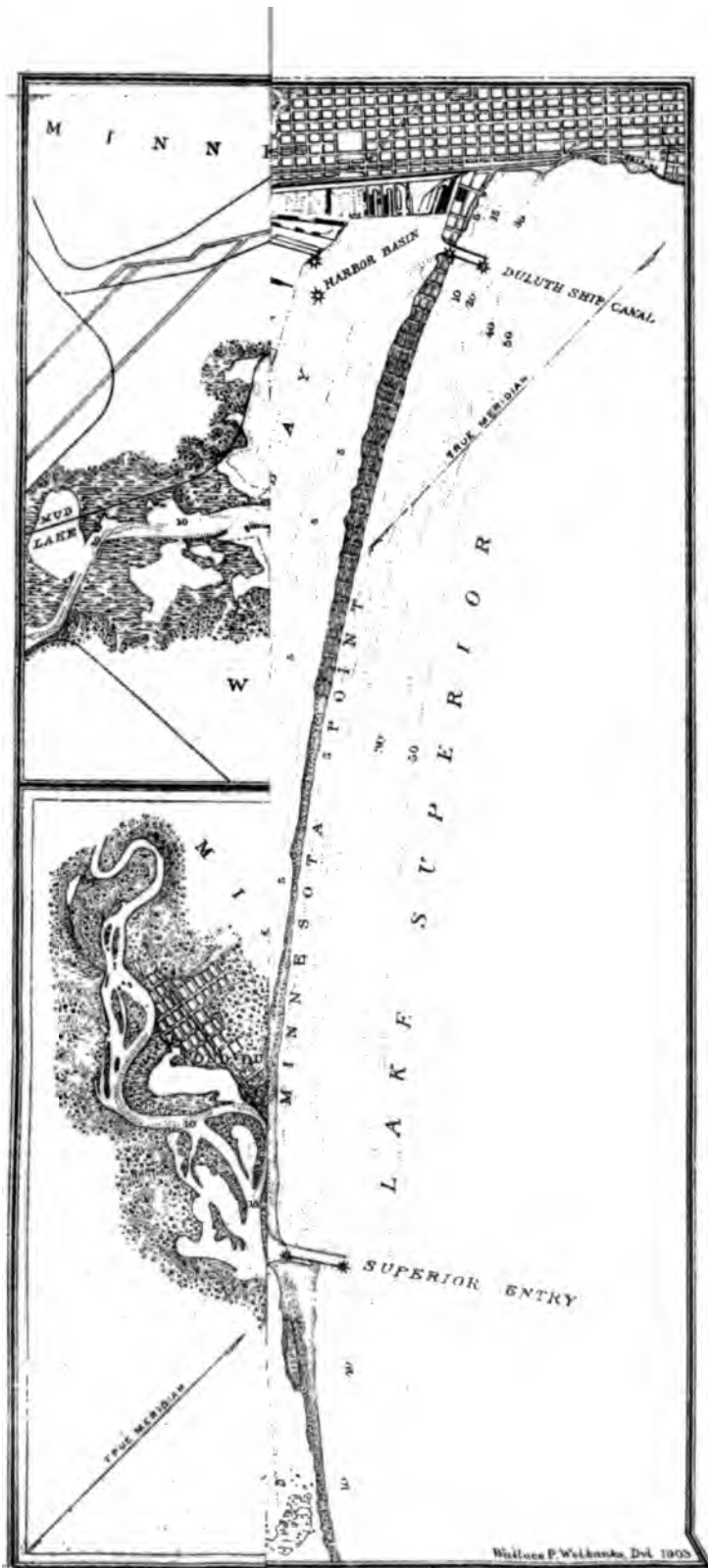
*Valuations.*—Valuations of freight were obtained from the various trade journals, commercial records, and the principal wholesale dealers, and are based on average wholesale prices on board vessels for exports and landed on wharves for imports.

*Cargo received.*—Two million nine hundred and thirty-two thousand five hundred and ninety tons of cargo were received through the Duluth Canal, and 345,207 tons, not including logs, through the Wisconsin entry. One hundred and thirteen million five hundred and nineteen thousand feet B. M. of logs came through the Wisconsin Entry, of which amount 72,149,000 feet B. M. came to Duluth.

*Cargo departing.*—Nine million one hundred and sixty-eight thousand six hundred and fifty-one tons of cargo departed through the Duluth Canal, and 5,059,345 tons through the Wisconsin entry. Of the latter amount 126,457 tons were loaded at Duluth.

*Cargo tons.*—All freight tons used in this report are of 2,000 pounds.

Wheat and other grains show an increase of 2,784,855 bushels, with a valuation over \$3,247,277 greater than in 1901.





Receipts of coal (hard and soft) show a decrease of 195,722 tons, with a decrease in valuation of \$173,131 under those of 1901.

Iron ore shows an increase of 4,420,033 tons over 1901.

The total freight traffic of 17,505,793 tons shows an increase of 4,532,420 tons over 1901, with a valuation of \$33,138,876 more than in 1901.

The Wisconsin Entry has an increase of 2,074,086 net registered tons and 2,159,671 tons of freight over 1901.

The total number of passengers arriving and departing was 121,292, an increase of 23,878 over 1901 and 85,490 over 1895. Part of this increase was due to local excursion business.

Average net registered tonnage recorded at Duluth, exclusive of tugs, 1,568.

Vessels recorded at Duluth Canal were: Entering, 4,595; departing, 4,250. Net registered tonnage of vessels entering, 6,705,150; net registered tonnage of vessels departing, 6,128,780; total number of vessels entering and departing, 8,845; total net registered tonnage of vessels entering and departing, 12,833,930.

Average net registered tonnage of vessels arriving at and departing from Superior, exclusive of tugs, was 1,766.

Vessels recorded at Wisconsin entry were: Entering, 1,331; departing, 1,604; total, 2,935. Net registered tonnage of vessels entering, 2,190,785; departing, 2,787,882; total, 4,978,667.

Average number of tons cargo received per day at Duluth and Superior, 12,754.

Average number of tons cargo shipped per day from Duluth and Superior, 56,016.

The navigation season covered a period of two hundred and sixty-four days. This is reckoned from first departure for and last arrival from the lower lakes. The open season for Duluth-Superior Harbor to and from Lake Superior ports only was much longer, as some local boats ran every month of the year.

*Duluth Canal.*—First boat departed for lower lakes March 30.

First entered from lower lakes April 6.

Last boat departed for lower lakes December 8.

Last boat arrived from lower lakes December 18.

North-shore boats were running at close of calendar year.

*Wisconsin entry.*—First boat arrived from lower lakes April 6.

First boat departed for lower lakes April 7.

Last boat arrived from lower lakes December 18.

Last boat departed for Duluth December 24.

#### K K 4.

#### IMPROVEMENT OF HARBOR AT PORT WING, WISCONSIN.

By act of Congress approved June 13, 1902, the following provision was made for the improvement of this harbor:

Improving the harbor at Port Wing, Wisconsin, in accordance with the report submitted in House Document Numbered One hundred and fourteen, Fifty-sixth Congress, first session, for a harbor of refuge, twenty-five thousand dollars: *Provided*, That no part of said sum shall be expended until the title of the land necessary for the establishment of said harbor, according to said report, shall have been properly and legally conveyed by or through the authorities of Port Wing to the United States Government.

In 1902 the citizens of Port Wing took steps which resulted in the conveyance to the United States of a tract of land containing about 7 acres which was needed for the purpose of harbor improvement. Its boundaries are shown on the accompanying map.

For approved project, see current summary, page 468.

Upon the acquirement by the United States of the necessary land, and after due advertisement, contract was entered into with Hugo & Tims, dated March 28, 1903, for building the east pier, 800 feet long, building a pile revetment 126 feet long at inner end of east pier, dredging a channel 75 feet wide and 15 feet deep through the entrance, and partly dredging out the proposed slip along the slough.

# 1810 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

Work under the contract began June 1, 1903. During the month of June there were dredged 24,333 yards, giving a channel through the entrance 14 feet at low-water datum for a narrow width, and making it possible for a vessel drawing 15 feet to pass through the entrance at the present stage. A trench has been dredged 12 feet deep for the east pier, and the building of this pier was commenced June 15.

The channel will be widened some further under the present contract.

The available balance and the appropriation recommended will be expended for the completion of the project.

## Money statement.

July 1, 1902, balance unexpended.....	\$25,000.00
June 30, 1903, amount expended during fiscal year.....	781.36
July 1, 1903, balance unexpended.....	24,218.64
July 1, 1903, amount covered by uncompleted contracts.....	23,500.00
{ Amount (estimated) required for completion of existing project.....	19,992.00
{ Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903 .....	19,992.00
{ Submitted in compliance with requirements of sundry civil act of June 4, 1897.	

## APPROPRIATIONS

By act of Congress approved June 13, 1902 ..... \$25,000

## CONTRACT IN FORCE.

Contract was entered into March 28, 1903, with Hugo & Tims, of Duluth, Minn., approved by Chief of Engineers April 16, 1903, for pier work and dredging at Port Wing, Wis., work to commence as soon as navigation will permit in the spring of 1903, and be completed by October 1, 1903. Prices as follows: For entrance pier, \$13.60 per linear foot; for dredging, 21 cents per cubic yard; for back filling, 21 cents per cubic yard; for riprap of sandstone, \$1.45 per ton of 2,000 pounds; for revetment, \$12 per linear foot.

## COMMERCIAL STATISTICS.

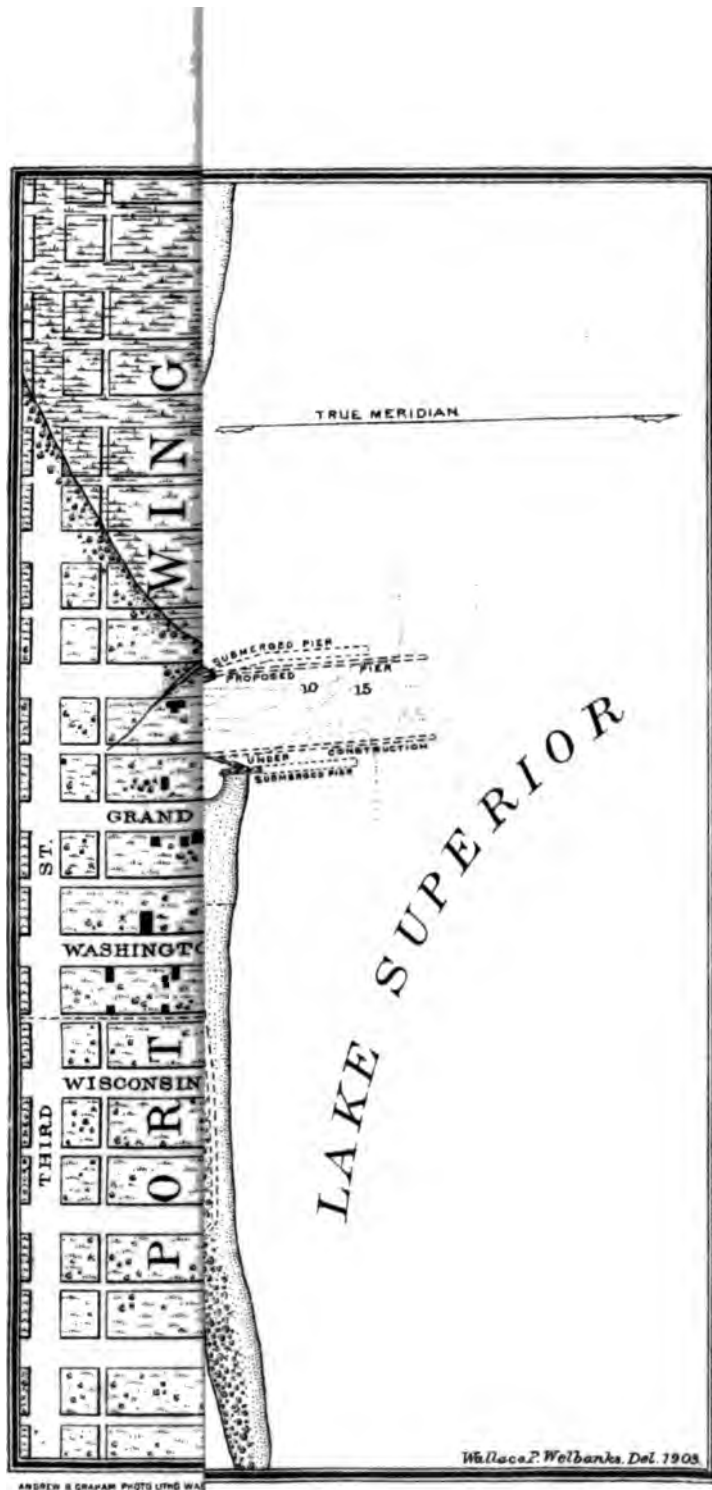
### Arrivals and clearances of vessels at Port Wing, Wis., for calendar year 1902.

Vessels.	Arrivals.	Clearances.	Total.	Tonnage.
Steam.....	417	417	834	124,170
Sail.....	11	11	22	13,330
Total.....	428	428	a 856	a 137,500

a Partly estimated.

Freight received and shipped.	Tons. <sup>b</sup>	Valuation.
General merchandise.....	1,724	\$256,600
Coal, hard.....	25	156
Lumber, 19,120,000 feet B. M.....	28,680	291,680
Cedar poles (48,240).....	6,080	72,360
Cedar ties (76,760).....	4,264	30,704
Total.....	40,723	653,400

<sup>b</sup>Tons of 2,000 pounds.





## K K 5.

## IMPROVEMENT OF HARBOR AT ASHLAND, WISCONSIN.

Prior to June 30, 1903, no work had been done upon this project since 1900. For further details see pages 2863-2864, Appendix K K, Report of the Chief of Engineers, United States Army, for 1901.

By act of Congress approved June 13, 1902, the sum of \$40,000 was appropriated for continuing improvement and for maintenance of this work.

Contracts have been entered into for the expenditure of this appropriation as follows:

1. For dredging an extension of the harbor-front channel to the westward, James Pryor, contractor. Under this contract 20,833 yards have been removed, at a price of 24 cents per yard. Work under this contract was commenced June 15 and completed June 26, 1903. It has resulted in extending the former channel about 900 feet to the westward in the vicinity of the wharves of the Keystone Lumber Company and the Barker Lumber Company. This extended channel lies 150 feet away from the harbor line and parallel thereto, and has a width of about 100 feet and a depth of 20 feet at low-water datum. It will accommodate the largest vessels. The present termination of the dredged channel is nearly on prolongation of the west line of Beaser avenue.

The material dredged, consisting of a mixture of sand and clay, was dumped alongside the United States breakwater, for the purpose of strengthening this structure.

2. A contract entered into with A. Donald & Co., dated March 23, 1903, provides for placing riprap alongside and on top of a portion of the breakwater, which is a temporary structure of piles and slabs, so as to form a rubble mound with the present breakwater as a hearting.

Previous to this work, it should be stated, a large quantity of dredged material from the United States channel and from private slips had been dumped alongside the breakwater during recent years, amounting to probably as much as 300,000 yards, for the purpose of forming a partial embankment of earth and to serve as a foundation for the riprap embankment. This earth fill raised the bottom to a height of 10 feet or more for the greater portion of the length of the breakwater, and it is expected that more will be added. All private dredgings are required by this office to be so deposited. This earth fill has therefore been placed without cost to the United States, excepting for the salary of an inspector to watch and direct the private dumping at times.

The work of depositing rock under the present contract began June 6, 1903. Up to June 30, 1903, 2,722 tons had been placed, at a contract price of 85 cents per ton of 2,000 pounds. This revetted 156 linear feet of the breakwater, beginning at the east end of the older and narrower portion (20 feet wide), which was built in 1889 and is the most decayed. The point of beginning is 1,021 feet from the extreme east-erly end of the breakwater.

The rock is sandstone from the Houghton Point quarries, about 6 miles distant. The pieces which form the slopes and covering are from 25 to 50 cubic feet in size. Smaller rock is placed at the bottom, next



# 1812 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

to the pier, so that the entire product of the quarry is utilized. About 31,000 tons will be placed under present contract, at a cost (including administration) of about \$29,000. The cost per linear foot is now estimated at about \$24, including an allowance for settling and finishing off, making probable cost of revetting the entire 7,363 linear feet of breakwater \$176,712.

A survey made in July, 1902, of the harbor-front channel showed comparatively little shoaling since it was dredged by the United States in 1897.

Available balance and appropriation recommended will be applied to further dredging and maintenance.

## Money statement.

July 1, 1902, balance unexpended .....	\$40,829.37
June 30, 1903, amount expended during fiscal year .....	2,027.93
July 1, 1903, balance unexpended .....	38,801.44
July 1, 1903, amount covered by uncompleted contracts.....	31,000.00
Amount (estimated) required for completion of existing project.....	386,500.00
Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903:	
For works of improvement.....	\$25,000.00
For maintenance of improvement .....	100,000.00
	125,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

## ABSTRACT OF APPROPRIATIONS FOR IMPROVING HARBOR AT ASHLAND, WIS.

By act of Congress—		By act of Congress—	
Approved August 5, 1886....	\$22,500	Passed June 3, 1896.....	\$27,000
Of August 11, 1888.....	60,000	Approved March 3, 1899....	35,000
Approved September 19, 1890.....	60,000	Approved June 13, 1902....	40,000
Approved July 13, 1892....	45,000	Total .....	314,500
Of August 18, 1894.....	25,000		

## ABSTRACT OF CONTRACT IN FORCE.

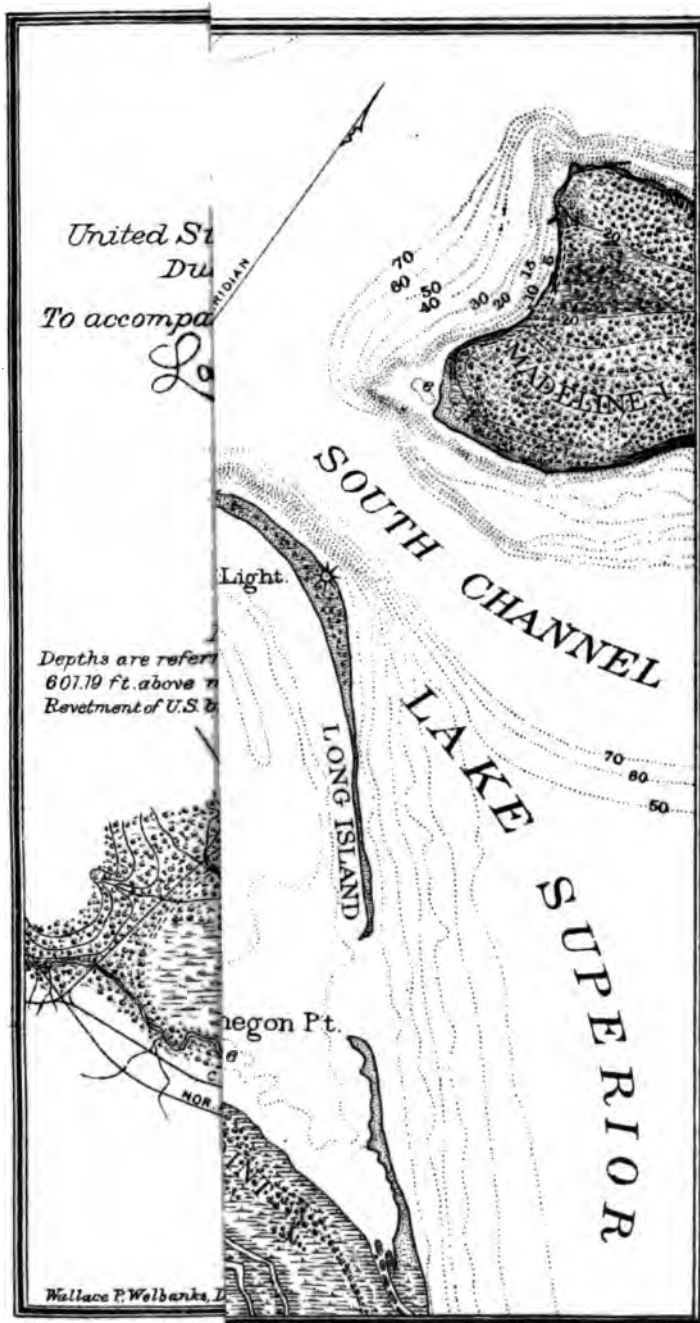
Name: A. Donald & Co., Ashland, Wis.  
Rates: 85 cents per ton of 2,000 pounds of riprap in place on the breakwater.  
Approved: April 20, 1903.  
To begin spring of 1903 and complete December 1, 1903.

## COMMERCIAL STATISTICS.

### Arrivals and clearances of vessels for 1902.

	Number.	Net registered tonnage.
Arrivals.....	1,309	a 2,051,848
Clearances.....	1,309	a 2,051,847
Total.....	2,618	4,103,695

a Estimated.





*Principal articles of export and import for 1902.*

Shipments.	Tons.	Receipts.	Tons.
Iron ore.....	3,980,400	Coal, hard.....	12,776
Pig iron.....	10,814	Coal, soft.....	276,308
Lumber (228,744,020 feet).....	843,116	Merchandise.....	2,041
Total.....	4,334,330	Total.....	291,120

Total receipts and shipments, 4,625,450 tons.

Total valuation, \$16,701,927.

Logs received, 202,350,000 feet B. M.

## K K 6.

## IMPROVEMENT OF HARBOR AT ONTONAGON, MICHIGAN.

For further details see Annual Report of the Chief of Engineers, U. S. Army, for 1896.

\* \* \* \* \*

Soundings taken in May, 1903, show a shoaling of from 1 to 2 feet in the entrance and harbor since the last complete soundings of 1899. The present available or least depth along the line of best water at low-water datum is as follows: In lake in front of entrance, 14 feet; between the entrance piers, 12½ feet, except near the extreme inner end, where there is a bar with but 11 feet; from the entrance piers up to the lumber dock and the Commercial dock, 10 feet.

A survey of the harbor and of the river up to a distance of about five-eighths of a mile above the bridge was made in June, 1903, under directions of this office, by H. H. Wadsworth, assistant engineer. A reduced copy of the resulting map accompanies this report.

By act of Congress approved June 13, 1902, the sum of \$5,000 was appropriated for the maintenance of this work. This sum will be mostly expended in dredging the harbor above the entrance piers, work on which began June 29, 1903, and is now in progress. Contractor, James Pryor. Amount to be dredged, about 18,000 yards. Price, 23 cents per yard. This price is high, and the amount of work to be done is small, on account of the small size of the contract and the distance necessary to tow the dredge. The amount to be dredged is insufficient for a proper deepening of the harbor in accordance with the approved project.

Available balance and appropriation recommended will be applied to further dredging and maintenance.

\* \* \* \* \*

*Money statement.*

July 1, 1902, balance unexpended.....	\$5,320.27
June 30, 1903, amount expended during fiscal year.....	163.40
July 1, 1903, balance unexpended.....	5,156.87
July 1, 1903, outstanding liabilities.....	10.00
July 1, 1903, balance available.....	5,146.87
July 1, 1903, amount covered by uncompleted contracts.....	4,000.00

{ Amount that can be profitably expended in fiscal year ending June 30, 1905, for maintenance of improvement, in addition to the balance unexpended July 1, 1903..... 10,000.00  
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.

# 1814 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

## ABSTRACT OF APPROPRIATIONS FOR IMPROVING HARBOR AT ONTONAGON, MICH.

By act of Congress—		By act of Congress—	
Approved March 2, 1867....	\$97,600	Approved August 5, 1886....	\$13,000
Approved July 7, 1870.....	10,000	Passed August 11, 1888.....	12,500
Approved June 23, 1874....	23,000	Approved September 19, 1890	10,000
Approved March 3, 1875....	25,000	Approved July 13, 1892....	20,000
Approved August 14, 1876..	15,000	Passed August 7, 1894.....	7,000
Approved June 18, 1878....	15,000	Passed June 3, 1896.....	10,000
Approved March 3, 1879....	17,000	Received on account of dam-	
Approved June 14, 1880....	15,000	age to piers .....	28
Approved March 3, 1881....	20,000	Approved June 13, 1902....	5,000
Passed August 2, 1882.....	20,000		
Approved July 5, 1884.....	15,000	Total .....	350,128

## CONTRACT IN FORCE.

With James Pryor, of Houghton, Mich., approved April 6, 1903, for dredging, at 23 cents per cubic yard. Work began June 29, 1903, and to be completed within one month.

## COMMERCIAL STATISTICS.

### Arrivals and clearances of vessels for 1902.

	Class.	Number.	Net registered tonnage.
Arrivals .....	Steamers .....	144	25,200
Clearances .....	do .....	144	25,200
Total .....		288	50,400

### Principal articles received and shipped, 1902.

Receipts.	Tons.	Shipments.	Tons.
General merchandise .....	2,122	General merchandise .....	243
Coal .....	300	Shingles .....	150
Cedar poles .....	1,875	Lumber .....	792
		Fish .....	170
		Farm produce .....	83
Total .....	a 4,297	Total .....	a 1,438

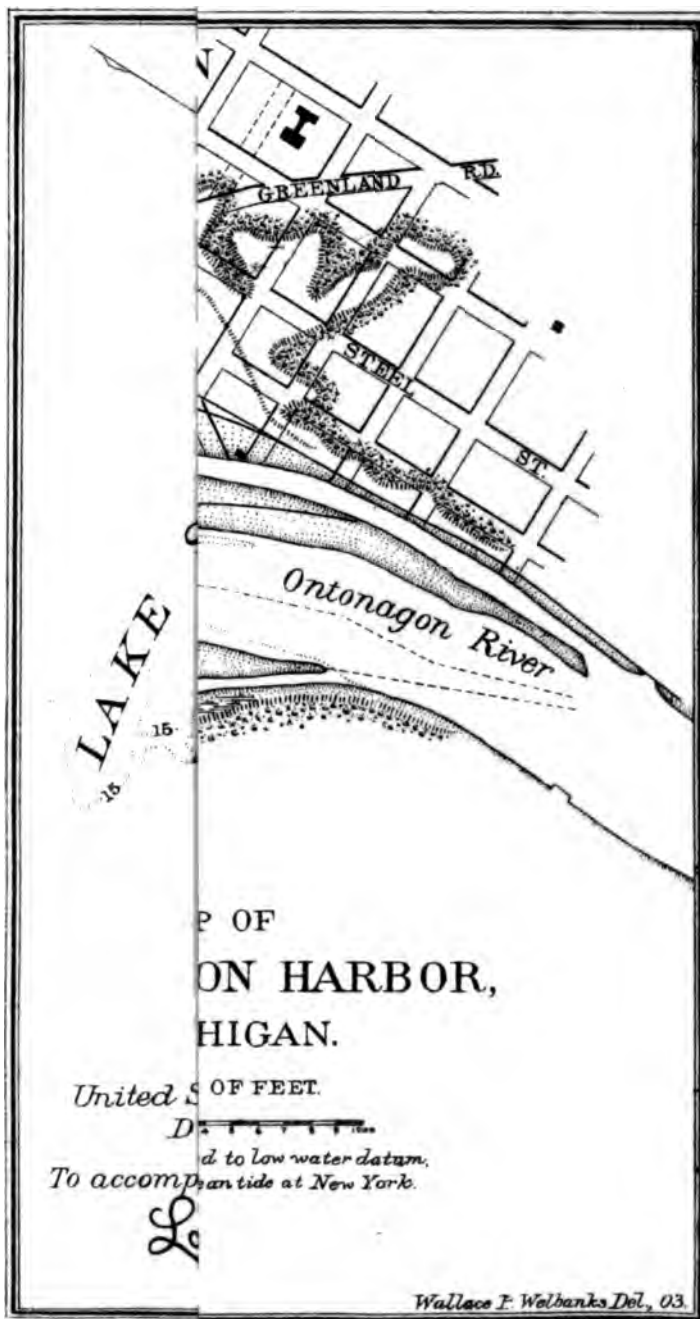
a Does not include logs.

Logs received, 2,250,000 feet B. M.; logs shipped, 1,500,000 feet B. M.

### Freight received and shipped.

[Tons of 2,000 pounds.]

Items.	Quantity.	Valuation.
General merchandise .....	2,365	\$354,750
Coal .....	300	1,575
Fish .....	170	17,000
Farm produce .....	83	8,300
Cedar poles .....	15,000	22,500
Shingles .....	1,500	4,125
Lumber .....	528	8,084
Logs .....	2,750	46,875
Total valuation .....		463,300



ANDREW S. GARRAM PHOTO LITHO



## K K 7.

IMPROVEMENT AND OPERATING AND CARE OF WATERWAY FROM  
KEWEENAW BAY TO LAKE SUPERIOR, MICHIGAN.

For details, see pages 2868–2871, Annual Report of the Chief of Engineers for 1901, and pages 2030–2033, Annual Report of the Chief of Engineers for 1902.

## IMPROVEMENT OF WATERWAY.

The act of June 3, 1896, authorized continuous contracts for the improvement of this waterway to the amount of \$1,065,000.

The following amounts have been appropriated under this act to carry out the approved project:

Sundry civil act of—	
June 4, 1897 .....	\$350,000
July 1, 1898 .....	450,000
June 6, 1900 .....	110,000
March 3, 1901 .....	145,000
March 3, 1902 .....	10,000
Total .....	1,065,000

The work of dredging under contract with James Pryor, dated March 17, 1902, is still in progress under extension of time.

At the upper canal the work done consisted in the removal of 37,533 cubic yards of hard material and bowlders from between the breakwater piers along the channel, to a width of 400 feet and a depth of 25 feet, and the channel between the old entrance piers was also deepened.

At the head of Portage Lake, along the course from Rouleau Point to the canal, a channel depth of from 20 to 24 feet was secured by the removal of 39,454 yards of mostly soft material.

In Portage River from Cut 4 to Keweenaw Bay 93,198 yards were dredged in deepening and straightening the channel, and 83,948 yards from Cut 4 to above Princess Point, the latter being a very hard material, consisting in some places of a shaly sandstone.

Since the completion of the breakwaters at the upper entrance no further shoaling has occurred at that point, which formerly required annual dredging in the spring.

The present dimensions of channel through this waterway are as follows, all the depths being referred to low-water datum:

At upper entrance inside the breakwaters the approach to the old entrance piers is 25 feet deep for a width of 400 feet. Between the old entrance piers the depth is 20 feet for a width of 200 feet.

The upper canal is 19 feet deep and 120 feet wide, except at one place just below Lily Pond, where the depth is 18 feet.

Lily Pond is 19 feet deep and 600 feet wide. At head of Portage Lake, on the course between the upper canal and Rouleau Point, 20 feet deep, 160 feet wide.

Portage Lake has a least depth of 19 feet along the vessel course, excepting at a point about  $1\frac{1}{2}$  miles south of the south end of the upper canal on the Rouleau Range course, and seven-eighths mile north of the High Point light, where there is found a least depth of 17 feet. The general depth is much greater.



Portage River, from Portage Lake to Princess Point, least depth 20 feet, width 75 to 120 feet. From Princess Point to Stone dock, depth 21 feet, width generally 120 feet, but only 90 feet at Cut 3. From Stone dock to Keweenaw Bay, 22 feet deep and 120 feet wide.

Dredging under the present contract, which is expected to be completed in August, 1903, will further widen and deepen the channel above Princess Point.

The watchman's house, which was under construction at the beginning of the fiscal year, was fully completed in July, 1902, at a cost of \$2,437. A small wharf was built in front of this house and some bank protection, at a cost of \$110 for the driving of piles and a small amount of new timber, the timber being mostly taken from an old revetment and the labor being performed by the crew of the Government launch.

No further work is contemplated under the head of improving waterway, as the dredging now under contract will use up the available funds.

As there still remain several places where there is a deficiency in depth or width, as already stated, additional funds will be needed in order to complete the channels to the full dimensions of the authorized project—that is, to give a width and depth of 120 feet and 20 feet, respectively.

The available funds and appropriation recommended will be used in dredging and maintenance.

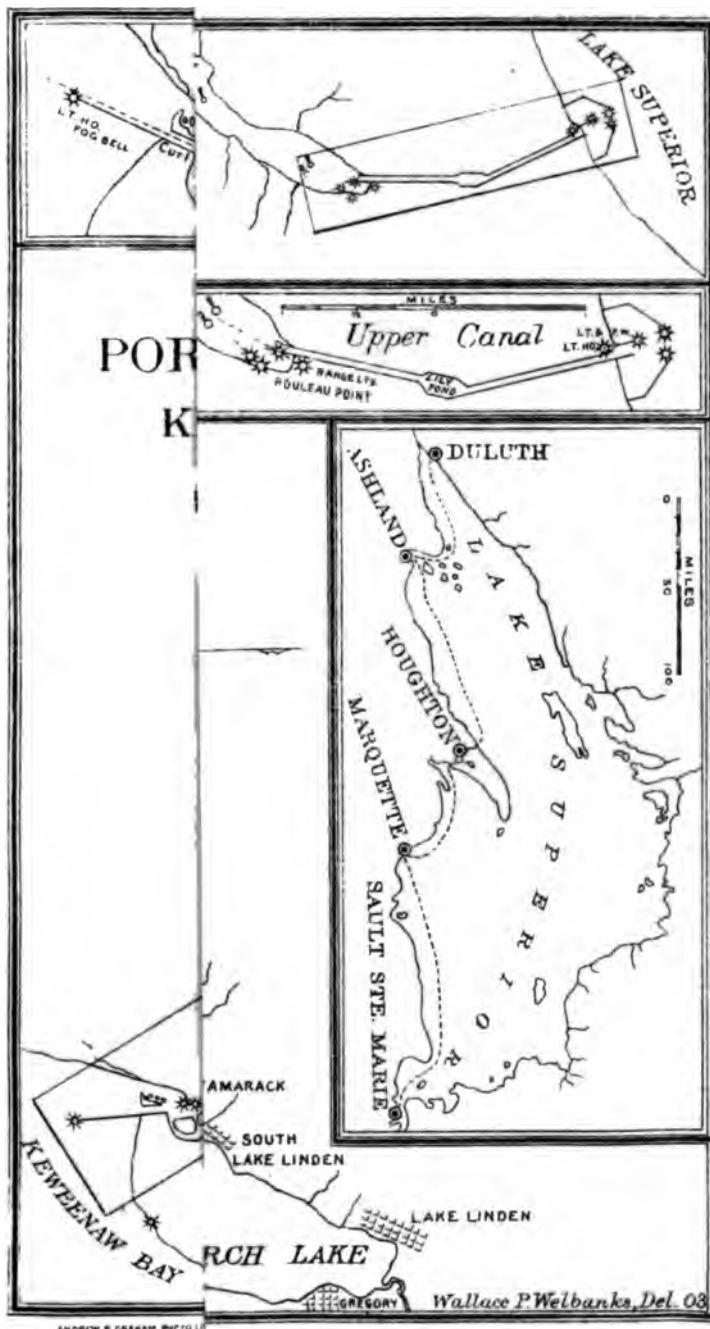
#### OPERATING AND CARE.

*Location.*—The Portage Lake ship canals constitute the waterway across Keweenaw Point in the State of Michigan, from Keweenaw Bay to Lake Superior, there being about 25 miles of water route, consisting of  $5\frac{1}{4}$  miles of Portage River, with its four cuts, 17 miles of Portage Lake, and  $2\frac{1}{4}$  miles in the upper canal from the head of Portage Lake to Lake Superior.

Under authority of the river and harbor act of September 19, 1890, the Secretary of War allotted \$9,000 for operating and care of canals and other works of navigation, to be applied to Portage Lake and Lake Superior canals, Michigan, for the fiscal year ending June 30, 1903.

The approved project for the expenditure of this allotment is to maintain the depth and width obtained by the work of improvement; to keep a record of the vessels and their tonnage using the canals; to exercise the necessary care in enforcing regulations for the use of the canals; to make frequent surveys to determine changes and to check up work done in dredging; to guard against encroachments on the legally established harbor lines, and to perform other work incident to the operation and care of the canals. The amount allotted has been expended in removing 2,336 cubic yards of material from the channel near Princess Point, under contract with James Pryor dated March 17, 1902, at a cost of \$397.06, for repairs to piers and revetments, extensive surveys for a new chart of the waterway, and in carrying out the other routine requirements of the project.

Two watchmen have been employed, W. W. Van Patten at the upper canal and Alex. McArthur at Portage River. Each has kept a record of all passing vessels and rafts, reported damage to piers and revetments from collisions, violations of rules and regulations, and





read a water gauge. The watchman at upper canal also kept a record of three wave dynamometers located on the breakwater piers.

Encroachments upon public channels by structures or by dumping of material or refuse has been watched and prevented. Water-gauge readings at Houghton have been continued thrice daily. This gauge is well referred to low-water datum and to sea level, and being well protected from the waves and swells of the lake, furnishes a good standard for the stage of Lake Superior.

Maps and tracings are being made of survey work of the entire waterway, and these will be forwarded to the United States Lake Survey, Detroit, as soon as completed.

The immediate charge of this waterway has continued under the management of Mr. G. A. Marr, as assistant engineer and superintendent.

### *Money statements.*

#### IMPROVEMENT.

July 1, 1902, balance unexpended .....	\$51,003.44
June 30, 1903, amount expended during fiscal year .....	42,437.72
July 1, 1903, balance unexpended .....	8,565.72
July 1, 1903, outstanding liabilities .....	4,167.92
July 1, 1903, balance available .....	4,397.80
July 1, 1903, amount covered by uncompleted contracts .....	4,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1905, for maintenance of improvement, in addition to the balance unexpended July 1, 1903.....	
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	
	10,000.00

#### OPERATING AND CARE OF CANALS.

July 1, 1902, amount allotted for fiscal year 1903 .....	\$9,000.00
June 30, 1903, amount expended during fiscal year 1903 .....	9,000.00
July 1, 1903, amount allotted for fiscal year 1904 .....	15,500.00

#### APPROPRIATIONS.

Act September 19, 1890:	
For the purchase of Portage canals .....	\$350,000.00
For maintenance to June 30, 1902 .....	10,000.00
For harbor lines, Portage Lake .....	5,128.70
Total .....	365,128.70

The above amounts were expended for the purposes for which appropriated.

#### ABSTRACT OF APPROPRIATIONS FOR IMPROVING WATERWAY FROM KEWEENAW BAY TO LAKE SUPERIOR, MICHIGAN.

By act of Congress—		By act of Congress—	
Approved July 13, 1892 ..	\$50,000	Approved June 6, 1900...	\$110,000
Of August 18, 1894.....	130,000	Approved March 3, 1901 .	145,000
Passed June 3, 1896.....	50,000	Approved June 28, 1902..	10,000
Approved June 4, 1897...	350,000	Total .....	1,295,000
Approved July 1, 1898...	450,000		

# 1818 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

The following statement shows the manner in which the appropriations have been expended. The amount expended under the different classes of work includes the cost of examinations, soundings, superintendence, buoying, and contingencies:

Dredging .....	\$496,000.00
Pier work, revetment, etc.....	781,028.28
Purchase of land .....	9,406.00
Total .....	1,286,434.28

*Allotments for operating and care of Portage Lake and Lake Superior canals, Michigan, from the permanent indefinite appropriation of act of July 5, 1884, for operating and care of canals, etc.*

July 1, 1892.....	\$31,028	July 1, 1899.....	\$8,300
July 1, 1893.....	11,647	July 1, 1900.....	8,300
July 1, 1894.....	8,000	July 1, 1901.....	8,500
July 1, 1895.....	11,500	July 1, 1902.....	9,000
July 1, 1896.....	8,300	July 1, 1903.....	15,500
July 1, 1897.....	8,300		
July 1, 1898.....	8,300	Total .....	136,675

Previous to the 1902 allotment all the amounts were expended in maintaining the canals, except \$117.36 of the 1892 allotment, which amount reverted to the Treasury. The \$15,500 allotted July 1, 1903, will be expended during the fiscal year ending June 30, 1904.

## ABSTRACT OF CONTRACTS IN FORCE JUNE 30, 1903.

Name and address of contractor.	Kind of work.	Section.	Rate per cubic yard.	Date of approval.	Date for beginning work.	Date for completion.
James Pryor, Houghton, Mich.	Dredging .....	1	\$0.19	Apr. 1, 1902	May 10, 1902	a Nov. 1, 1902
		2	.10			
		3	.17			
		4	.10			
		5	.10			

a Extended for a reasonable time by authority of Chief of Engineers, October 23, 1902. Inspection expenses charged to the contractor.

## COMMERCIAL STATISTICS.

*Statistics of vessels passing through the canals during the calendar year 1902.*

	Bound up.		Bound down.	
	Number.	Net tonnage.	Number.	Net tonnage.
Steam.....	1,396	1,330,408	841	586,472
Sail .....	562	370,687	319	208,491
Total.....	1,958	1,701,095	1,160	794,963

Total number of vessels up and down..... 3,098  
Total net tonnage of vessels up and down..... 2,491,058

*Statistics of tugs passing through the canals during the calendar year 1902.*

	Bound up.	Bound down.
Trips.....number.....	770	768
Net registered tonnage.....	29,863	29,572
Vessels.....number.....	22	11
Scows.....do.....	448	446
Rafts.....do.....	39	69
Booms.....do.....	72	58
Logs.....M. feet.....	19,154	11,283
Lumber.....do.....	7,793	227
Timber.....do.....	2,357	240
Cordwood.....cords.....	1,833	.....
Building stone.....tons.....	21,357	2,076
Coal.....do.....	70	250
Manufactured iron.....do.....	.....	580
Brick.....M.....	473	.....
Clay.....tons.....	.....	190
Sand.....do.....	900	.....
Gravel.....do.....	.....	1,215
Miscellaneous merchandise.....do.....	408	223

*Statement of freight and passengers carried through the Portage Lake and Lake Superior canals, 1902.*

Bound up.	Tons.	Bound down.	Tons.
Coal:		Copper.....	56,650
Hard.....	70,011	Grain.....	5,600
Soft.....	963,099	Wheat.....	25,181
Manufactured iron.....	20,774	Flour.....	44,829
Salt.....	20,387	Building stone.....	5,200
Copper.....	30,396	Iron ore.....	193,536
Limestone.....	53,981	Pig iron.....	1,588
Oil.....	5,455	Lumber.....	631,316
Building stone.....	6,268	Flaxseed.....	20,500
Lumber.....	17,889	Stamp sand.....	18,250
Stamp sand.....	3,443	Gravel.....	9,300
Miscellaneous merchandise.....	163,601	Coal, soft.....	14,855
Total.....	1,375,307	Miscellaneous merchandise.....	17,210
Total down.....	1,044,024	Total.....	1,044,024
Total through canals.....	2,419,331		
Local, estimated.....	112,992		
Grand total.....	2,532,323		

*Statistics of vessels passing through the upper canal (Portage Lake ship canals) for the calendar year 1902.*

	Steam vessels.		Sailing vessels.	
	Number.	Net tonnage.	Number.	Net tonnage.
Bound up.....	1,189	1,159,401	433	274,784
Bound down.....	670	450,536	264	147,054

## TRANSPORTATION LINES.

In regard to this report, usually given, there does not seem to be any particular reason to specify any lines of steamers and vessels, as all lines that now navigate on Lake Superior are liable to use these canals frequently, and the condition of the channels is now such as to permit the use of this waterway by any vessels that can pass through the "Soo" River.

# 1820 REPORT OF THE CHIEF OF ENGINEERS, U S. ARMY.

Table showing estimated value of freight passing through Portage Lake ship canals for the calendar year 1902.

[Tons of 2,000 pounds.]

Items.	Quantity.	Unit price.	Valuation.
Coal:			
Hard.....	70,011 tons.	\$6.25	\$437,569
Soft.....	998,274 do.	4.00	3,993,096
Flour.....	448,290 barrels.	4.00	1,793,160
Flax.....	732,159 bushels.	1.50	1,098,238
Wheat.....	839,380 do.	.74	621,141
Other grains.....	280,010 do.	.50	140,005
Manufactured iron.....	21,304 tons.	65.00	1,384,760
Pig iron.....	1,588 do.	21.00	33,348
Iron ore.....	193,536 do.	2.25	435,456
Copper.....	87,055 do.	250.00	21,763,750
Building stone.....	34,901 do.	7.00	244,307
Limestone.....	53,984 do.	1.50	80,976
Oils.....	27,275 barrels.	7.00	190,925
Salt.....	142,711 do.	.60	85,627
Sand and gravel.....	22,199 cubic yards.	1.00	22,199
Lumber.....	344,627 M feet.	15.25	5,255,562
Logs.....	31,140 do.	12.50	389,250
General merchandise.....	182,383 tons.	150.00	27,357,450
Total.....			65,326,819

In the above table there is given only the regular through business both ways through these canals. There is a large local business from one part of Portage Lake to another and over in Torch Lake done by tugs with scows, booms, etc., transporting lumber, cord wood, hay, charcoal, etc., and also towing rafts of logs and timber, amounting in value to over \$1,000,000. There is also considerable traffic done by small local steamers, running between different points around Portage Lake, that do not make any reports unless they pass through Portage River or the Upper Canal.

Summary of expenditures made from appropriation for operating and care of canals and other works of navigation (indefinite), act of July 5, 1884, applied to Portage Lake and Lake Superior canals, Michigan, during fiscal year 1903.

Date.	Office expenses.	Field service.	Miscellaneous.	Dredging.	Total.
1902.					
August.....	\$58.00	\$361.84	\$131.45		\$551.29
September.....	3.00	764.90	64.97		832.87
October.....	65.00	443.65	538.85		1,047.50
November.....	828.00	375.28	20.09		723.37
December.....	53.00	746.67	321.01		1,120.68
1903.					
January.....	15.00	271.67	44.24		330.91
February.....	428.00	967.84			1,395.84
March.....	5.26	5.10			10.36
April.....	158.33	363.00	55.10		576.43
May.....	228.00	386.00	78.00		692.00
June.....	138.27	339.00	844.42	\$397.06	1,718.75
Total.....	1,479.86	5,024.95	2,098.13	397.06	9,000.00

## K K 8.

### IMPROVEMENT OF HARBOR AT MARQUETTE, MICHIGAN.

For details, see Annual Report of the Chief of Engineers for 1901, page 2877, and earlier reports.

\* \* \* \* \*

The act of Congress approved June 13, 1902, contains the following provisions:

Improving harbor at Marquette, Michigan: Continuing improvement and for maintenance, twenty-six thousand dollars: *Provided*, That a contract or contracts may be entered into by the Secretary of War for such materials and work as may be necessary for the completion of said project, to be paid for as appropriations may

from time to time be made by law, not to exceed in the aggregate eighty thousand dollars, exclusive of the amounts herein and heretofore appropriated: *And provided further*, That of the sum provided for improvement and maintenance an amount not exceeding seven thousand five hundred dollars may be expended in connecting the Presque Isle breakwater with the shore.

The sundry civil act of March 3, 1903, appropriated \$80,000 in accordance with the foregoing act.

Under these provisions, work has been resumed upon the construction of concrete superstructure in accordance with the authorized project.

In view of the fact that the United States owns a large part of the plant which would be required for the work, also a considerable quantity of broken stone, and a number of large footing blocks which form the lower part of the superstructure, authority was given by the Chief of Engineers to expend the sums available under the above acts in the purchase of cement, sand, broken stone and all material and plant necessary for the completion of the concrete superstructure, after due advertisement, and to do the work by hired labor.

Active work has been in progress during the months of May and June, 1903, preparatory to depositing concrete.

Contracts have been entered into with the Alpena Portland Cement Company for furnishing 6,000 barrels of Portland cement to be delivered at the breakwater; with Noah Pelissier for 4,000 yards of sand, and a written agreement with Lipsett & Sinclair for crushed stone, at \$1.80. Bids under advertisement for crushed stone were too high; rejected. No formal contract was made.

Repairs have been made to buildings and old plant on hand, 1,200 feet of railroad track laid from warehouses and bins to the breakwater and out upon the completed structure; purchases made of a locomotive, supply cars, concrete mixer, and other plant and material; about 3,500 square feet of the old timber superstructure cut down to low-water datum, and work of setting the concrete footing blocks commenced.

A survey has been made of the unfinished breakwater and mapped on a large scale.

\* \* \* \* \*

The work is in charge of F. L. Dever, United States assistant engineer.

The available balance and appropriation asked for will be expended in the construction of concrete superstructure to its completion and for maintenance.

#### *Money statement.*

July 1, 1902, balance unexpended .....	\$26,098.64
Amount appropriated by sundry civil act approved March 3, 1903 .....	80,000.00
	<hr/> 106,098.64
June 30, 1903, amount expended during fiscal year .....	10,822.71
July 1, 1903, balance unexpended .....	95,275.93
July 1, 1903, outstanding liabilities .....	4,000.00
July 1, 1903, balance available .....	<hr/> 91,275.93
July 1, 1903, amount covered by uncompleted contracts .....	<hr/> 18,000.00
<hr/>	
{ Amount that can be profitably expended in fiscal year ending June 30, 1905, for maintenance of improvement, in addition to the balance unexpended July 1, 1903 .....	
{ Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	
	5,000.00



# 1822 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

## ABSTRACT OF APPROPRIATIONS FOR IMPROVING HARBOR AT MARQUETTE, MICH.

By act of Congress—	By act of Congress—
Approved March 2, 1867 (allotment) ..... \$85,000.00	Of August 11, 1888..... \$25,000.00
Approved April 10, 1869 (allotment) ..... 26,730.00	Approved September 19, 1890..... 40,000.00
Approved July 11, 1870.. 25,000.00	Approved July 13, 1892.. 80,000.00
Approved March 3, 1871.. 60,000.00	Of August 18, 1894..... 30,000.00
Approved June 10, 1872.. 50,000.00	Passed June 3, 1896..... 29,000.00
Approved March 3, 1873.. 15,000.00	Deposited in United States Treasury Janu- ary 28, 1896..... 327.76
Approved June 23, 1874.. 15,000.00	July, 1898, repayment .. .93
Approved March 3, 1875.. 15,000.00	Of March 3, 1899..... 25,000.00
Approved June 18, 1878.. 2,000.00	Approved June 13, 1902.. 26,000.00
Approved August 14, 1878 2,000.00	Sundry civil act March 3, 1903..... 80,000.00
Approved March 3, 1879.. 1,500.00	Total ..... 664,558.69
Approved June 14, 1880.. 1,000.00	
Passed August 2, 1882... 18,000.00	
Approved July 5, 1884.. 5,000.00	
Approved August 5, 1886 10,000.00	

## LIST OF EXISTING CONTRACTS.

Contract was entered into with Noah Pelissier, of Marquette, Mich., May 14, 1903, for furnishing sand for the concrete work, at 49 cents per cubic yard, approved by the Chief of Engineers May 25, 1903. Time of beginning work, May 15, 1903, and to be completed by September 1, 1904.

Contract was entered into with the Alpena Portland Cement Company, of Alpena, Mich., dated May 1, 1903, approved by the Chief of Engineers May 27, 1903, for furnishing 6,000 barrels of Portland cement for pier work at Marquette, Mich., at the rate of \$2.40 per barrel, delivered in barrels, and \$2.30 per barrel, delivered in sacks (4 sacks to the barrel), with a rebate of 10 cents per sack for each sack returned. Delivery to commence by May 10, 1903, and be completed by August 10, 1903.

## COMMERCIAL STATISTICS.

### Shipments and receipts by lake of leading articles during calendar year 1902.

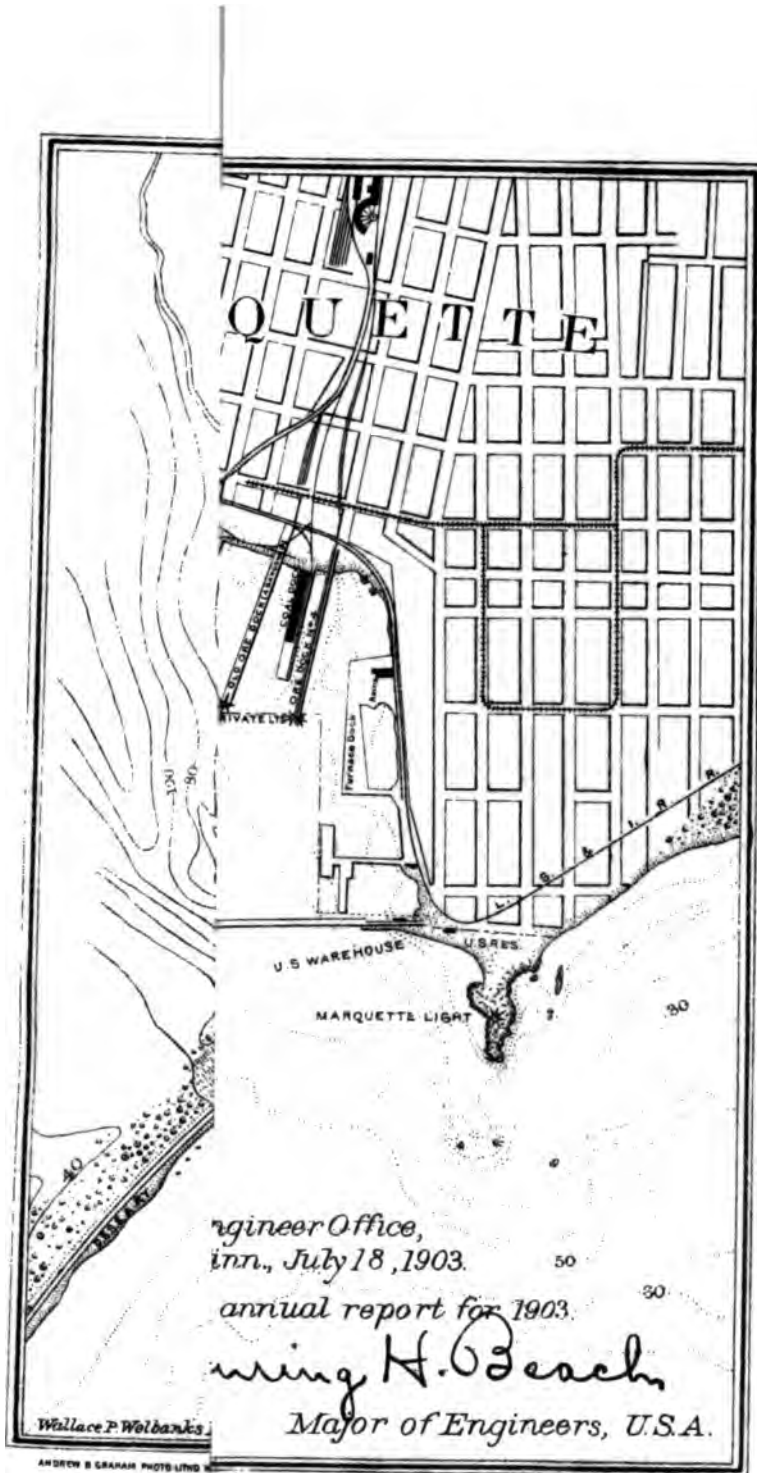
[Tons of 2,000 pounds.]

Shipments.	Tons.	Receipts.	Tons.
Iron ore.....	2,903,051	Coke.....	82
Pig iron.....	5,572	Railroad iron.....	126
Timber.....	720	Coal.....	173,524
Lumber.....	26,948	General merchandise.....	687
Total.....	2,986,291	Total.....	174,418

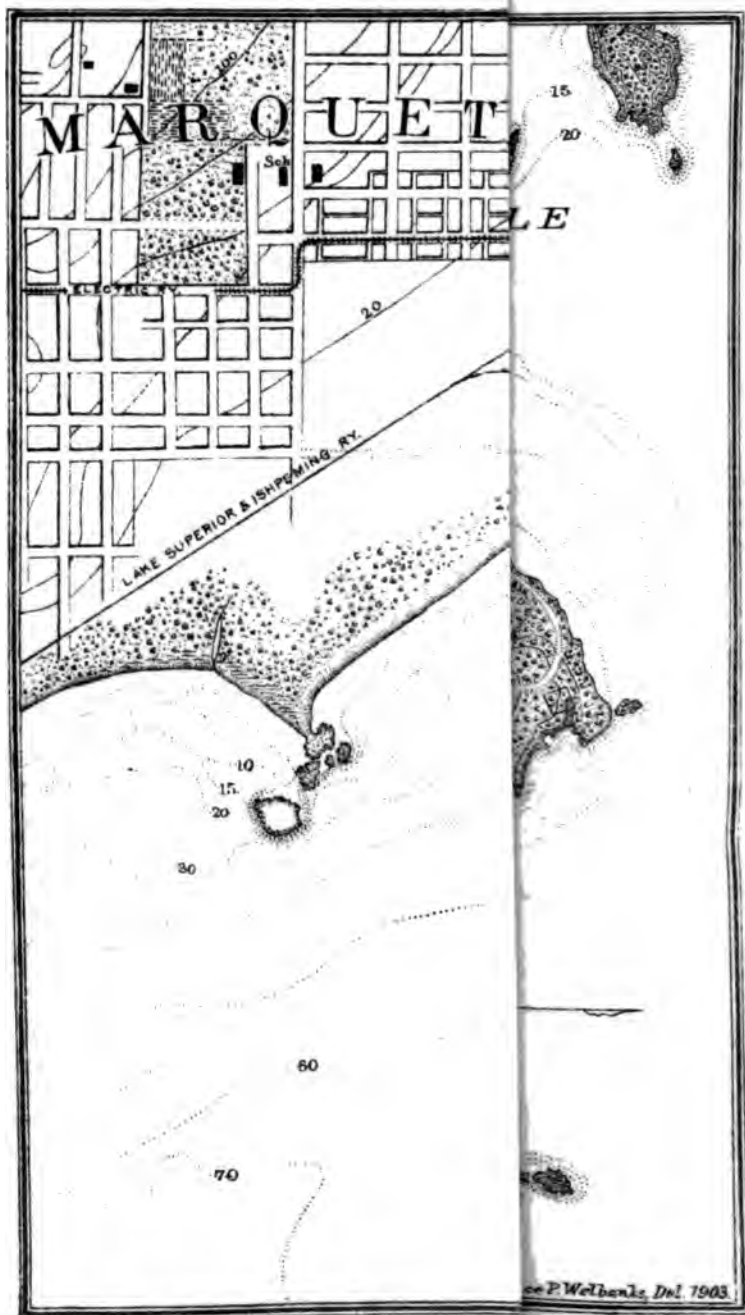
Total receipts and shipments, 3,110,709 tons; total valuation, \$7,882,883.

### Vessel tonnage, 1902.

	Arrived.	Cleared.	Tonnage.	Average tonnage.
Steam.....	825	810	2,727,616	.....
Sail.....	149	144	881,861	.....
Total.....	974	954	3,109,467	1,610
Increase.....	230	188	784,350	50







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## F K o.

## HARBOR OF REFUGE, MARQUETTE BAY, MICHIGAN.

This harbor is also known as Presque Isle Harbor.

For the description of the locality and the interests to be benefited by the improvement see Annual Report of the Chief of Engineers, United States Army, 1896, pages 2385, 2386.

The act of Congress approved June 13, 1902, makes an appropriation for Marquette Harbor, Michigan (an entirely separate work 1½ miles distant), and provides that out of this appropriation "an amount not exceeding seven thousand five hundred dollars may be expended in connecting the Presque Isle" (harbor of refuge, Marquette Bay, Michigan) "breakwater with the shore."

After due advertisement a contract was entered into with Hugo & Tims, under which a timber pier was built, 16 feet wide, to a height of 8.6 feet above low-water datum, and 216 feet long, extending from the breakwater to the shore, and a revetment of rock constructed at the shore end for a linear distance along the shore of about 100 feet. The closing of this gap affords some slight additional protection to the harbor and prevents erosion of the sand-bluff shore.

This work was done between October 6 and November 26, 1902, at a contract cost of \$5,993.62 and \$802.68 for engineering and administration, making a total cost of \$6,801.30.

The available balance, with appropriation asked for, will be used for maintenance.

*Money statement.*

July 1, 1902, balance unexpended .....	\$489.42
June 30, 1903, amount expended during fiscal year .....	60.00
July 1, 1903, balance unexpended .....	409.42
<div> <div> Amount that can be profitably expended in fiscal year ending June 30, 1905, for maintenance of improvement, in addition to the balance unexpended July 1, 1903..... </div> <div> Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899. </div> </div>	
	1,000.00

## ABSTRACT OF APPROPRIATIONS FOR HARBOR OF REFUGE, MARQUETTE BAY, MICHIGAN.

## Act of Congress—

Passed June 3, 1896.....	\$20,000
Approved March 3, 1899 .....	30,000
Total .....	50,000

# 1824 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

## COMMERCIAL STATISTICS.

### *Receipts and shipments, 1902.*

[Tons of 2,000 pounds.]

Shipments.	Tons.	Receipts.	Tons.
Pig iron .....	5,518	Coal, soft .....	16,528
Iron ore .....	1,727,246		
Lumber (9,000,000 feet) .....	75,500		
Lath (1,177,000) .....	294		
Total .....	1,748,558	Total .....	16,528

Approximate value of commerce, 1902, \$4,210,231.

Vessels.	Arrived.	De- parted.	Total.
Steam .....	447	447	894
Sail .....	78	78	156
Total .....	525	525	1,050

## 'K K 10.

### IMPROVEMENT OF HARBOR OF REFUGE AT GRAND MARAIS, MICHIGAN.

For further details, see page 2881, Appendix K K, Report of the Chief of Engineers, United States Army, 1901, and page 3610 of report for 1900.

To serve as a proper harbor of refuge for all classes of vessels, the entrance should have a safe, navigable depth of at least 20 feet.

The sand about Grand Marais shifts extensively, and to secure the depth called for in the present project the piers should be fully and rapidly extended to the 22-foot curve and a channel dredged out between them. To preserve this channel it is quite probable that dredging will have to be done annually or biennially.

The act of Congress approved June 13, 1902, appropriated \$70,000 for continuing the improvement of this harbor.

This sum will be expended in pier extension, dredging, and maintenance. Pier extension is now under construction by Powell & Mitchell, contractors, they being the lowest bidders, after due advertisement. Under this contract the east pier of the harbor entrance will be extended 192 feet and the west pier 256 feet.

The new work consists of timber cribs 24 feet wide, 18½ feet deep, and 64 feet long, seated upon piles cut off at 17½ feet below low-water datum, and surmounted by a timber superstructure 5 feet above low-water datum. The timber work is ballasted with rock, and some riprap will be placed at the base, but not to interfere with navigation.

The use of bearing piles was adopted for this work for the reason that the previously constructed piers were subject to serious settlement by undermining of the sand, which the brush mattresses, on which the cribs were placed, and the riprap at the sides, proved ineffectual to prevent. In order to effect a saving in material, both in

the original construction and in future renewals, only one-half of the width of the cribs is to be surmounted by a superstructure, which will be 12 feet wide and 5 feet above low water, leaving a lower deck 12 feet wide near the water surface, which it is expected will always remain wet and be free from decay. On June 30, 1903, two cribs had been placed in position and partially ballasted. There has also been constructed under the same contract 201 linear feet of superstructure on the north end of the east pier, the cribs for which were built in 1900 and left to settle. The work under this contract began May 4, 1903. Mr. A. A. Sinclair, United States inspector, is superintendent of the work.

A survey was made in July, 1902, of those portions of this harbor subject to change from shifting sand, and for showing improvements to date.

The least depth found in mid-channel between entrance piers was 13 feet, low-water datum, showing a shoaling of about 1 foot since May, 1900.

The lake shore west of the entrance continues to advance into the lake. The pile dike 5,770 feet long, which was built in 1895–1897 across the natural entrance, was found in fair condition, and in need of but few repairs. It is serving the purpose for which it was built by arresting to a great extent the movement of sand which had threatened to fill up the harbor, and is slowly forming a bar along its length. There is, however, some movement still of sand through the dike, which may require attention later.

A partial examination of the channel in May, 1903, showed a least depth in mid-channel of about 13 feet, indicating but little change since July, 1902.

It is proposed to apply the available balance and appropriation recommended to the completion of work of pier extension under contract to removing about 40,000 yards of material from the channel by dredging, further pier extensions, and dredging, and to repairing the old piers and the pile dike, at an estimated cost of about \$2,000, maintenance, etc.

*Money statement.*

July 1, 1902, balance unexpended .....	\$70,000.00
Amount received account sale United States property .....	125.00
	<hr/> 70,125.00
June 30, 1903, amount expended during fiscal year .....	2,841.25
	<hr/> 72,966.25
July 1, 1903, balance unexpended .....	67,283.75
July 1, 1903, outstanding liabilities .....	2,000.00
	<hr/> 69,283.75
July 1, 1903, balance available .....	65,283.75
	<hr/> 65,283.75
July, 1, 1903, amount covered by uncompleted contracts .....	45,200.00
	<hr/> 110,483.75
{ Amount (estimated) required for completion of existing project .....	83,401.68
{ Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903 .....	83,401.68
{ Submitted in compliance with requirements of sundry civil act of June 4, 1897.	

# 1826 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

## ABSTRACT OF APPROPRIATIONS FOR IMPROVING HARBOR OF REFUGE AT GRAND MARAIS, MICH.

By act of Congress—		By act of Congress—	
Approved June 14, 1880.	\$10,000.00	Passed June 3, 1896.....	\$24,000.00
Approved March 3, 1881.	20,000.00	Approved March 3, 1899.	25,000.00
Passed August 2, 1882....	40,000.00	Allotted from act June 6,	
Approved July 5, 1884..	35,000.00	1900.....	384.32
Approved August 5, 1886	26,250.00	Approved June 13, 1902.	70,000.00
Of August 11, 1888.....	50,000.00	Sale of United States prop-	
Approved September 19,		erty.....	125.00
1890.....	50,000.00		
Approved July 13, 1892.	30,000.00	Total.....	400,723.32
Of August 18, 1894.....	20,000.00		

### EXISTING CONTRACT.

Contract was entered into January 29, 1903, with Powell & Mitchell, of Marquette, Mich., approved by Chief of Engineers March 7, 1903, for building 448 linear feet of extensions to the entrance piers, at \$91.26 per linear foot, complete, including everything; 201 linear feet of superstructure to present east pier, at \$9.67 per linear foot, complete, including rock filling; 2,316 tons of riprap at base of piers, at \$1.75 per ton of 2,000 pounds in place. Work to commence as soon as weather conditions will permit in spring of 1903, and be completed by December 1, 1903.

### COMMERCIAL STATISTICS.

#### *Arrivals and clearances of vessels at Grand Marais, Mich., 1902.*

Year.	Steam vessels.		Sailing and towing vessels.		Total arrivals.	Clearances.
	Number.	Tonnage.	Number.	Tonnage.		
1902.....	370	300,000	86	100,000	456	456

Total vessels, 912; total tonnage, 800,000 (estimated).

#### *Principal articles received and shipped, 1902.*

Shipments.	Tons.	Receipts.	Tons.
Lumber (60,000,000 feet) .....	90,000	Merchandise .....	5,000
Shingles (79,000 M).....	7,900	Coal.....	8,100
Lath (20,000 M).....	5,000	Logs (163,000 feet).....	9,000
Fish.....	300		
Ties (81,000).....	4,500		
Miscellaneous merchandise.....	325		
Total.....	108,025	Total.....	17,100
Valuation.....	\$1,313,400	Valuation.....	\$764,438

Total freight, 125,125 tons.

Approximate value of commerce, \$2,077,838.



eer Office,  
July 18, 1903.

ual report for 1903.

GRAN *ing H. Beach*  
Major of Engineers, U.S.A.

1903, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 930, 931, 932, 933, 934, 935, 936, 937, 938, 939, 940, 941, 942, 943, 944, 945, 946, 947, 948, 949, 950, 951, 952, 953, 954, 955, 956, 957, 958, 959, 960, 961, 962, 963, 964, 965, 966, 967, 968, 969, 970, 971, 972, 973, 974, 975, 976, 977, 978, 979, 980, 981, 982, 983, 984, 985, 986, 987, 988, 989, 990, 991, 992, 993, 994, 995, 996, 997, 998, 999, 1000

Depths as  
above mean  
Pier exte



ANDREW B. GRANAH PHOTO

Eng 58 1



## RÉSUMÉ.

*Cost of operations on each work, both for fiscal year ending June 30, 1903, and since the commencement of operations, with total vessel freight and estimated value of same.*

[Tons of 2,000 pounds.]

Name of work.	Amount expended during fiscal year ending June 30, 1903.	Vessel freight, 1902.		Date of commencement of improvement by the United States.	Total amount expended by United States to June 30, 1903.	Vessel freight from commencement of work to Jan. 1, 1903.	
		Tons.	Estimated value.			Tons.	Estimated value.
Grand Marais, Minn.	\$204.75	24, 233	\$338, 975	1880	\$163, 298. 93	79, 892	\$3, 065, 839
Agate Bay, Minn.	135. 07	6, 563, 456	15, 789, 960	1887	244, 158. 06	39, 092, 759	79, 145, 978
Duluth-Superior...	412, 590. 39	a 17, 505, 793	194, 444, 695	1867	4, 462, 468. 29	120, 964, 166	1, 809, 102, 514
Port Wing, Wis.	781. 36	40, 723	653, 400	1903	781. 36	72, 150	958, 400
Ashland, Wis.	2, 027. 93	b 4, 625, 450	16, 701, 927	1887	275, 698. 56	47, 618, 562	403, 659, 566
Ontonagon, Mich.	163. 40	c 5, 735	463, 309	1867	344, 971. 13	2, 710, 864	71, 365, 654
Waterway across Keweenaw Point	42, 437. 72	d 2, 532, 323	65, 326, 819	1891	1, 286, 434. 28	e 13, 934, 920	448, 290, 719
Operating and care of same.....	9, 000. 00			1891	121, 057. 64		
Marquette, Mich.	10, 822. 71	3, 110, 709	7, 882, 883	1867	569, 282. 76	25, 490, 776	121, 021, 300
Harbor of Refuge, Marquette Bay, Michigan.....	60. 00	1, 762, 886	4, 210, 231	1897	49, 590. 58	8, 854, 616	21, 625, 871
Harbor of Refuge, Grand Marais, Mich.	2, 841. 25	f 125, 125	2, 077, 838	1880	333, 439. 57	992, 299	12, 290, 767
Total .....	481, 064. 58	36, 296, 433	307, 890, 037	.....	7, 851, 176. 16	259, 811, 004	2, 970, 526, 608

a Does not include 136,600,000 feet of logs; b 202,350,000 feet; c 3,750,000 feet; d 31,140,000 feet, a total of 373,840,000 feet.

e Largely freight passing through canals.

f Includes logs.

## K K II.

## REMOVING SUNKEN VESSELS OR CRAFT OBSTRUCTING OR ENDANGERING NAVIGATION.

For further details see page 2722, Report of the Chief of Engineers, United States Army, for 1899.

In October, 1902, it was discovered that a considerable portion of the lower part of the wreck of the steamer *Toledo* still existed, and being a menace to navigation, a five-day circular letter was issued by this office, soliciting bids for its removal. Two bids were received—one a general proposition, with several provisos; the other, that of Whitney Brothers, of West Superior, Wis., for the lump sum of \$400, which proposition being the lowest, and the price being reasonable, was accepted, and work ordered to be commenced immediately.

An allotment of \$400 was made from the indefinite appropriation for the removal of wrecks, act of March 3, 1899, and the work authorized by letter from office of the Chief of Engineers, United States Army, November 4, 1902.

Work was commenced November 8, 1902, and progressed continuously during fair weather until the entire removal of all pieces of the wreck, nine days later. The site of the wreck was "swept" and afterwards sounded with a pole and found clear.

The steamer *Thomas Wilson*, which was sunk June 7, 1902, in Lake Superior near the Duluth Canal, has not as yet been removed. Details concerning this work are given on page 2042, Appendix II, Report of the Chief of Engineers, United States Army, for 1902. The owners are said to have sold the wreck to Wieland Brothers, Duluth, and the latter planned to raise it, but have not yet begun actual operations. The smokestack, which reached to within 10 feet of the water surface, has disappeared, and a careful examination made by this office in April, 1903, showed that no part of the wreck was within 24 feet of the surface. The wreck is therefore no longer an obstruction to navigation, and is not marked.

The tug *Edward Gillen*, which was sunk in Lake Superior near the Superior Entry May 18, 1903, by collision with the steamer *Maunaloa* in a fog, as duly reported, was raised and brought into the harbor July 14, 1903, by the owners.

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K K 12.

ESTABLISHMENT OF HARBOR LINES ALONG THE SHORE OF LAKE SUPERIOR IN DULUTH HARBOR, MINNESOTA.

MENDENHALL & HOOPES,  
*Duluth, Minn., December 29, 1902.*

DEAR SIR: The undersigned, the Western Land Association of Minnesota, being the owner of lots 13, 14, 15, and southerly half of lot 16, in block 1, industrial division of Duluth in St. Louis County, Minn., desires to bulkhead and fill in the same to a distance of 300 feet easterly into Lake Superior from the easterly line of St. Croix avenue, as shown on the accompanying diagram, and they hereby respectfully ask the consent of the United States Government to make such improvement.

Yours, truly,

WESTERN LAND ASSOCIATION,  
By L. MENDENHALL, *Agent*.

Capt. D. D. GAILLARD,  
*Engineer of U. S. Army in Charge of  
Works on Lake Superior.*

[First indorsement.]

U. S. ENGINEER OFFICE,  
*Duluth, Minn., January 9, 1903.*

Respectfully forwarded to the Chief of Engineers, United States Army, inviting attention to my report herewith.

D. D. GAILLARD,  
*Captain of Engineers.*

(Through the Division Engineer.)

[Second indorsement.]

OFFICE DIVISION ENGINEER, NORTHWEST DIVISION,  
*Chicago, Ill., January 10, 1903.*

Respectfully forwarded to the Chief of Engineers, United States Army.

The recommendations contained in the accompanying report are recommended for approval.

O. H. ERNST,  
*Lieut. Col., Corps of Engineers,  
Division Engineer, Northwest Division.*

[Third indorsement.]

OFFICE CHIEF OF ENGINEERS,  
U. S. ARMY,  
*January 15, 1903*

Respectfully returned to Captain Gaillard.

This appears to be a clear case, but it is thought advisable in general that riparian proprietors be conferred with before harbor lines affecting their interests are established.

If the harbor line now recommended is satisfactory to all the riparian interests affected, that fact should appear in the papers. To be returned through the Division Engineer.

By command of Brigadier-General Gillespie:

A. MACKENZIE,  
*Colonel, Corps of Engineers.*

[Fourth indorsement.]

U. S. ENGINEER OFFICE,  
*Duluth, Minn., March 26, 1903.*

Respectfully returned to the Chief of Engineers, United States Army.

Messrs. Mendenhall & Hoopes, agents for the Western Land Association, state that they have endeavored to obtain the signatures of the riparian owners for the establishment of a harbor line, to be fixed in the position A B D, shown on the accompanying tracing,<sup>a</sup> but that it is impossible to reach a number of the riparian owners.

The inclosed petition embraces about 62 per cent of the riparian frontage, and as this represents a majority of the property, and as no privileges whatever are curtailed by the establishment of the harbor line, I would respectfully recommend its establishment along the line A B D instead of A B C, as previously recommended.

D. D. GAILLARD,  
*Captain of Engineers.*

[Eighth indorsement.]

OFFICE CHIEF OF ENGINEERS,  
U. S. ARMY,  
*April 24, 1903.*

Respectfully submitted to the Secretary of War.

The Western Land Association of Minnesota desires to make certain improvements on the water front of the city of Duluth in Lake

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<sup>a</sup> Not printed.

1880 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

Superior, and in compliance with the requirements of law makes application for the necessary permit from the Secretary of War.

Attention is respectfully invited to the accompanying report of January 9, 1903, by Captain Gaillard, the local engineer officer, from which it appears that the public interests involved would be best subserved by the establishment of a harbor line at the point in question. The lines selected and recommended by him are delineated and described on the accompanying chart.<sup>a</sup>

The lines appear to be unobjectionable, and in a separate paper is a request from a majority of the interested riparian owners that such lines be established.

Concurring, therefore, in the views of the local officer, I recommend that harbor lines be established as indicated on the tracing<sup>a</sup> herewith.

G. L. GILLESPIE,  
*Brig. Gen., Chief of Engineers,*  
*U. S. Army.*

[Ninth indorsement.]

WAR DEPARTMENT, *April 30, 1903.*

Approved as recommended by the Chief of Engineers.

W. SANGER,  
*Acting Secretary of War.*

REPORT OF CAPT. D. D. GAILLARD, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,  
*Duluth, Minn., January 9, 1903.*

GENERAL: I have the honor to submit the following report upon the application of the Western Land Association, through L. Mendenhall, agent, to fill in certain lots on the east side of St. Croix avenue, Duluth, Minn., for a distance of 300 feet easterly into Lake Superior.

No harbor lines have ever been established in the lake in the vicinity of Duluth-Superior Harbor, but with the increased growth of the city and its great commercial importance property on St. Croix avenue is increasing in value, and it seems desirable that a harbor line should be established in Lake Superior north of the Duluth Canal, thus permitting property owners on St. Croix avenue to improve lots to the east of said avenue by bulkheading and filling in the same, as is proposed in the case under consideration. It will be noticed from the inclosed tracing<sup>a</sup> that the strip of land to the east of this avenue is so narrow that, as a rule, the property there can not be improved without filling in the shallow water of the lake adjacent.

I would therefore respectfully recommend that a harbor line be established in the position shown on the inclosed tracing, i. e., parallel to and 300 feet from the north portion of St. Croix avenue and extending from the north pier of the Duluth Ship Canal to the north shore of the lake. The position proposed will not interfere in any way with the interests of navigation, and will not curtail any rights or privileges now enjoyed by the city of Duluth. There is no existing structure outside of the proposed harbor line, and the action recom-

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<sup>a</sup> Not printed.

mended will consist in conferring additional privileges upon property owners in the vicinity and would restrict none that they at present enjoy.

Very respectfully,

D. D. GAILLARD,  
*Captain of Engineers.*

Brig. Gen. G. L. GILLESPIE,  
*Chief of Engineers, U. S. A.*

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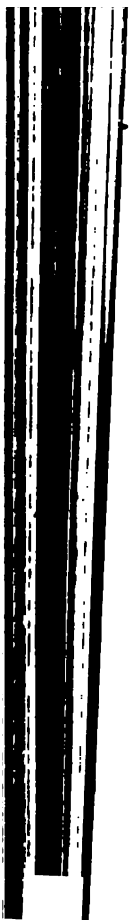
PETITION OF PROPERTY OWNERS ON EASTERLY SIDE OF ST. CROIX AVENUE, DULUTH, MINN.

DULUTH, MINN., *January 20, 1903.*

We, the undersigned owners of property abutting on the easterly side of St. Croix avenue, in the city of Duluth, Minn., respectfully request that a dock line be established in Lake Superior 300 feet easterly and parallel with the easterly line of St. Croix avenue north from the Duluth Ship Canal to the Northern Pacific Railroad right of way.

JULIUS D. HOWARD.  
WESTERN LAND ASSOCIATION,  
By MENDENHALL & HOOPES, *Agents.*  
JOHN HOLLERAN.  
CLYDE IRON WORKS,  
By C. A. LUSTER, *President.*  
MARY A. BANNING, *Executrix,*  
By MENDEHALL & HOOPES.  
JOSHUA LOVETT, W. D. SOLIER, *Trustees,*  
By MENDENHALL & HOOPES.  
A. M. SIGURD.  
AUG. JOHNSON.  
JOSEPH WÜTA.  
MRS. SARAH H. BANKS.  
H. HERMANSAN.  
MRS. CARRIE MOORE.  
OLE R. SETHER.

To Capt. D. D. GAILLARD,  
*Captain, U. S. Engineer Corps, Duluth, Minn.*





## APPENDIX L L.

### IMPROVEMENT OF RIVERS AND HARBORS ON WESTERN SHORE OF LAKE MICHIGAN.

REPORT OF MAJ. J. G. WARREN, CORPS OF ENGINEERS, OFFICER  
IN CHARGE, FOR THE FISCAL YEAR ENDING JUNE 30, 1903, WITH  
OTHER DOCUMENTS RELATING TO THE WORKS.

#### IMPROVEMENTS.

- |  |   |
|--|---|
| 1. Menominee Harbor and River, Michigan and Wisconsin.   | 9. Manitowoc Harbor, Wisconsin.                                   |
| 2. Oconto Harbor, Wisconsin.   | 10. Sheboygan Harbor, Wisconsin.                                  |
| 3. Greenbay Harbor, Wisconsin.   | 11. Port Washington Harbor, Wisconsin.                            |
| 4. Sturgeon Bay and Lake Michigan Ship Canal, and harbor of refuge connected therewith, Wisconsin. | 12. Harbor at Milwaukee, Wisconsin, including harbor of refuge.   |
| 5. Operating and care of Sturgeon Bay and Lake Michigan Ship Canal, Wisconsin.                     | 13. South Milwaukee Harbor, Wisconsin.                            |
| 6. Ahnapee Harbor, Wisconsin.  | 14. Racine Harbor, Wisconsin.                                     |
| 7. Kewaunee Harbor, Wisconsin.   | 15. Kenosha Harbor, Wisconsin.                                    |
| 8. Two Rivers Harbor, Wisconsin.   | 16. Waukegan Harbor, Illinois.                                    |
|  | 17. Fox River, Wisconsin.   |
|  | 18. Operating and care of locks and dams on Fox River, Wisconsin. |

#### SURVEY.

19. Manitowoc River and Harbor, Wisconsin.

#### HARBOR LINES.

20. Fox River at Oshkosh, Wisconsin. | 21. Fox River at Greenbay, Wisconsin.

UNITED STATES ENGINEER OFFICE,  
*Milwaukee, Wis., July 15, 1903.*

GENERAL: I have the honor to transmit herewith annual report for the works of river and harbor improvement in my charge for the fiscal year ending June 30, 1903.

Very respectfully, your obedient servant,

J. G. WARREN,  
*Major, Corps of Engineers.*

Brig. Gen. G. L. GILLESPIE,  
*Chief of Engineers, U. S. A.*

# 1834 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

## L L I.

### IMPROVEMENT OF MENOMINEE HARBOR AND RIVER, MICHIGAN AND WISCONSIN.

The natural condition of this work and projects for its improvement are described and references for more extended information and for reports on examinations and surveys are given in Annual Report of Chief of Engineers for 1902, page 439.

*Operations during the fiscal year.*—Under the existing contract for dredging 220,000 cubic yards, more or less, work was begun October 22, 1902, suspended December 5, resumed April 16, 1903, and in progress at the close of the fiscal year. During this period 134,162 cubic yards were removed from the channel and turning basin.

*Condition of the improvement.*—The piers are built the full length contemplated and are in fair condition with the exception of 1,050 linear feet that requires renewal above the water line.

Beginning at the 20-foot contour in Green Bay, for a distance of about 7,000 feet, the channel has the required depth of 20 feet below datum; thence for a distance of about 3,000 feet, dredging is in progress, but the navigable depth of 17 feet has not yet been increased; thence for a distance of about 1,700 feet, a depth of 20 feet with a minimum width of 100 feet in the channel, and 300 feet in the turning basin has been obtained.

*Proposed operations.*—It is proposed to apply the funds available in rebuilding above the water line 1,050 linear feet of the harbor piers, and make such other minor repairs as may be necessary, and dredging under the contract now in force in furtherance of the existing project, and to apply the additional appropriation of \$20,000 recommended in completing the 20-foot channel and enlargement of the basin by dredging.

It is probable that dredging under the existing contract will be completed by August 1, 1903, and will result in connecting the upper and lower sections of the 20-foot channels with a channel 20 feet deep and of navigable width but not of the full projected width.

*Remarks.*—The dredging under the existing contract indicates that there is a greater quantity of hardpan, bowlders, and rock encountered than was anticipated and estimated for when report on survey dated January 30, 1900, was submitted. See House Document No. 419, Fifty-sixth Congress, first session, and special report dated July 6, 1903, to which attention is invited.

For the completion of the project and for maintenance of existing works to June 30, 1905, an appropriation of \$20,000 is recommended.

#### Money statement.

July 1, 1902, balance unexpended .....	\$50, 803. 11
Miscellaneous receipts .....	1, 527. 00
	<hr/>
	52, 330. 11
June 30, 1903, amount expended during fiscal year .....	13, 836. 47
	<hr/>
July 1, 1903, balance unexpended .....	38, 493. 64
	<hr/>
July 1, 1903, amount covered by uncompleted contracts .....	23, 326. 46
	<hr/>
{ Amount (estimated) required for completion of existing project .....	20, 000. 00
{ Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903 .....	20, 000. 00
{ Submitted in compliance with requirements of sundry civil act of June 4, 1897.	

## APPROPRIATIONS.

Act of—		Act of—	
March 3, 1871.....	\$25,000.00	August 5, 1886.....	\$3,000.00
June 10, 1872.....	25,000.00	August 11, 1888.....	9,000.00
March 3, 1873.....	25,000.00	September 19, 1890.....	54,000.00
June 28, 1874.....	25,000.00	July 13, 1892.....	20,500.00
March 3, 1875.....	25,000.00	August 18, 1894.....	16,000.00
August 14, 1876.....	8,000.00	June 3, 1896.....	22,150.00
June 18, 1878.....	10,000.00	March 3, 1899.....	24,420.00
March 3, 1879.....	10,000.00	June 13, 1902.....	50,350.00
June 14, 1880.....	10,000.00	Miscellaneous receipts cred-	
March 3, 1881.....	12,000.00	ited to appropriations.....	1,669.03
August 3, 1882.....	15,000.00		
July 5, 1884.....	10,000.00	Total .....	401,089.03

## CONTRACT IN FORCE.

For dredging 200,000 cubic yards of sand, clay, and mud, at 12.9 cents per cubic yard, and 20,000 cubic yards of bowlders and hardpan, at 48 cents per cubic yard.

Name of contractor: Duluth Dredge and Dock Company.

Date of contract: August 25, 1902.

Date of approval: September 10, 1902.

Date of commencement: September 23, 1902.

Date of completion: January 22, 1904.

## COMMERCIAL STATISTICS FOR THE CALENDAR YEAR ENDING DECEMBER 31, 1902.

[Furnished by Mr. E. F. Craig, secretary Marinette General Improvement Association; Mr. G. Smith, collector of customs Marquette, Mich., and Mr. J. W. Loughrey, deputy collector of customs, Marinette, Wis.]

*Arrivals and departures of vessels.*

Description.	Arrivals.	Departures.
Steam .....	909	907
Sail .....	427	424
Total .....	1,336	1,331

*By way of the harbor.*

	Tons.
Exports .....	650,834
Imports .....	504,435
Total .....	1,155,269
Tonnage in calendar year ending December 31, 1901 .....	775,786
Increase in 1902 .....	379,483

*Principal articles of export.*—Lumber, beer, and general merchandise.

*Principal articles of import.*—Coal, stone, fish, oil, and general merchandise.

## L L 2.

## IMPROVEMENT OF OCONTO HARBOR, WISCONSIN.

The natural condition of this harbor and projects for its improvement are described, and references for more extended information and maps and for reports on examinations and surveys given, in Annual Report for 1902, pages 439-440.

# 1836 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

*Operations during the fiscal year.*—There were no operations.

*Condition of the improvement.*—No material change in the condition of this improvement has occurred since June 30, 1902 (see Annual Report for 1902, p. 2046).

*Proposed operations.*—It is proposed to apply the funds available in maintenance of existing works.

## Money statement.

July 1, 1902, balance unexpended.....	\$3,908.95
June 30, 1903, amount expended during fiscal year .....	258.72
July 1, 1903, balance unexpended .....	3,650.23
Amount (estimated) required for completion of existing project .....	22,610.00

## APPROPRIATIONS.

Act of—		Act of—	
March 3, 1881.....	\$10,000	August 18, 1894.....	\$3,000
August 2, 1882.....	15,000	June 3, 1896.....	4,000
July 5, 1884.....	15,000	March 3, 1899.....	15,000
August 5, 1886.....	8,000	June 13, 1902.....	3,000
August 11, 1888.....	20,000		
July 13, 1892.....	3,000	Total .....	96,000

## COMMERCIAL STATISTICS FOR THE CALENDAR YEAR ENDING DECEMBER 31, 1902.

[Furnished by Mr. Jacob Spies, mayor of Oconto, Wis.]

### Arrivals and departures of vessels.

Description.	Arrivals.	Departures.
Steam.....	196	196
Sail.....	70	70
Total.....	266	266

### By way of the harbor.

	Tons.
Exports .....	13,083
Imports .....	37,350
Total.....	50,433

*Principal articles of export.*—Lumber, wood, hay, and general merchandise.

*Principal articles of import.*—Stone, coal, hay, and brick.

## REPORT OF THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS.

WASHINGTON BARRACKS,

Washington, D. C., August 14, 1903.

GENERAL: 1. By first indorsement, Office Chief of Engineers, U. S. Army, May 1, 1903, there was referred to the Board of Engineers for Rivers and Harbors a resolution adopted by the Committee on Rivers and Harbors of the House of Representatives, wherein there was

required, among other things, the opinion of the Board upon the advisability of continuing the work of improvement at Oconto, Wis., or modifying the project therefor.

2. The Board has considered all the data obtainable in this case, including statements furnished by interested parties, and through a committee has visited the locality and held a public hearing at which interested parties were given full opportunity to express their views.

3. Oconto Harbor is on the west shore of Green Bay, at the mouth of the Oconto River. The city of Oconto is about 2 miles up the river. It has a population of about 7,000 and is reached by two railroads, the Chicago and Northwestern and the Chicago, Milwaukee and St. Paul. Below Oconto the river traverses a belt of low, swampy ground, the elevation of which is but slightly above the surface of the river. The original depth at the mouth of the river was about 3 feet and was increased by private enterprise to 4 feet before work was begun by the United States. Two piers have been constructed by the United States at the mouth of the river; the north pier is 1,603 feet long and the south 2,151 feet long. The clear width between them is 150 feet.

The existing project provides for the formation of a channel 100 feet wide and 9 feet deep (below datum) from Green Bay to Spies's mill, a distance of about 9,000 feet.

The 9-foot channel was completed to the required width in 1899, except for a distance of about 600 feet.

4. It transpired at the public hearing that local interests desire the formation, by pier construction and dredging, of a channel 18 feet deep from the lake to a basin of the same depth, to be excavated just within the shore line at the river mouth.

5. Oconto is a distribution center for the county of Oconto and several other counties lying to the westward. It is also the point at which the agricultural products and manufactures of this territory concentrate for export. At different times in the past the commerce of Oconto Harbor has been considerable. At the present time the volume of water-borne commerce is small, but rail shipments amount to about 500,000 tons a year. The principal present industries of Oconto and the contiguous territory are the preparation and shipment of timber products, the manufacture of pulp and paper, the canning of vegetables, and farming. The largest single industry is the manufacture of lumber. It is represented that the shipments of lumber, all made by rail, reach 70,000,000 feet, or about 120,000 tons annually. Large quantities of hay and other agricultural products are also exported. It is believed in Oconto that all the present industries, with the exception of the lumber business, will increase with time, especially if better harbor facilities are provided and rail rates thereby reduced. It is likewise anticipated that, on account of the presence in the neighborhood of large quantities of hemlock bark, tanneries will be established in Oconto or near by.

6. The Board was informed that the rates from Oconto to all points east (which are necessarily rail rates) are greater than the car-ferry rates from the neighboring ports, Menominee and Green Bay. It is represented that the execution of the improvement desired would give Oconto "water rates," thus putting Oconto on a par in this respect with Menominee and Green Bay, and would lead to the establishment between Oconto and the eastern shore of Lake Michigan, via the Sturgeon Bay Ship Canal, of a line or lines of car ferries. At the present time, so the Board is informed, car ferries are running from Manito-

woc, Kewaunee, and Menominee, the latter 19 miles north of Oconto, to Frankfort; and from Peshtigo, 12 miles north, to Chicago. Three regular lines of lake steamers, the Lackawanna, the Goodrich, and the Hart, run to Green Bay ports.

7. The execution of the desired improvement would probably effect a reduction in freight rates, but the cost of such improvement would be great, certainly not less than \$300,000. This sum would probably be sufficient to provide an 18-foot entrance channel and basin, but not a channel from said basin to the town.

The success of the improvement would depend upon the establishment, if necessary, by local enterprise of the link in transportation between the town and the new harbor. It seems, moreover, that even should this link be provided the success of the improvement might be in the hands of the railroads which enter Oconto. It is by no means certain that carrying out the desired improvement would result in the institution of a line of car ferries to Oconto; nor is Oconto so favorably situated for through trade east and west as are the existing harbors of Escanaba or Manitowoc. The gain to the community to follow from providing increased navigation facilities at this place is not capable of accurate ascertainment; but in the best judgment of the Board it would not be proportionate to the expense involved in carrying out the improvement. Moreover, this section of country already possesses two good harbors, viz, Menominee, 19 miles north of Oconto, and Green Bay, 28 miles south. The lumber industry, the most important at the present time, is one that can not last many years longer. The other industries are not at present of large proportions. In view of these facts the Board is of opinion that it is not desirable at the present time for the United States to increase the navigation facilities at this harbor, nor even to continue to maintain the long dredged channel in Oconto River above the mouth.

8. Should a change in commercial conditions lead to a revival of trade at Oconto sufficient to warrant the adoption of a comprehensive scheme of improvement, it is possible that use could be made of the present south pier, the outer 1,300 feet of which has recently been repaired and strengthened. On July 31, 1903, the balance available for improving harbor at Oconto was about \$3,650. The Board recommends that this sum be held for necessary repairs to the inshore 850 feet or other portion of the south pier.

9. Apart from this repair work the Board is of opinion that it is undesirable at the present time for the United States to do any further work at Oconto, Wis.

Respectfully submitted.

CHAS. J. ALLEN,  
*Lieut. Col., Corps of Engineers.*

H. F. HODGES,  
*Major, Corps of Engineers.*

EDW. BURR,  
*Major, Corps of Engineers.*

C. H. MCKINSTRY,  
*Captain, Corps of Engineers.*

W. V. JUDSON,  
*Captain, Corps of Engineers.*

Brig. Gen. G. L. GILLESPIE,  
*Chief of Engineers, U. S. A.*

[First indorsement.]

OFFICE CHIEF OF ENGINEERS,  
U. S. ARMY,  
September 17, 1903.

The views of the Board of Engineers for Rivers and Harbors, as expressed within, are concurred in.

G. L. GILLESPIE,  
Brig. Gen., Chief of Engineers,  
U. S. Army.

## L L 3.

## IMPROVEMENT OF GREEN BAY HARBOR, WISCONSIN.

The natural condition of this work and projects for its improvement are described, and reference for more extended information and for reports on examinations and surveys are given in Annual Report of the Chief of Engineers for 1902, page 440.

*Operations during the fiscal year.*—Under the existing contract for dredging 800,000 cubic yards, more or less, work was begun September 3, 1902, suspended December 2, resumed April 27, 1903, and was in progress at the close of the fiscal year.

During this period 147,974 cubic yards of material was removed from the channel.

By hire of labor and purchase of material in open market the renewal above the water line of the east revetment at Grassy Island was completed by building 70 linear feet 5 courses high, and 170 linear feet 2 courses in height.

*Condition of the improvement.*—The east revetment at Grassy Island, 705 feet long, is in good condition, the west revetment 620 feet long, requires renewal above the water line.

Soundings taken in February, 1901, indicated a depth of 17 feet below datum with a few unimportant exceptions in both channels.

It is probable that no material change has occurred in the inner channel since then. The dredging in the outer channel has not been carried its entire length, consequently its navigable depth is not yet increased.

*Proposed operations.*—It is proposed to apply the funds available—

First. In dredging to complete the outer channel to the required dimensions.

Second. Any balance that may be remaining, together with the additional appropriation recommended, in the renewal of the west revetment and dredging for maintenance of the channels.

An appropriation of \$11,770 for the maintenance of existing works for the fiscal year ending June 30, 1905, is recommended.

*Estimate.*

For rebuilding west revetment, 620 linear feet, at \$10.....	\$6, 200
For dredging 30,000 cubic yards, at 15 cents.....	4, 500
Contingencies, 10 per cent .....	1, 070
Total .....	11, 770

# 1840 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

## Money statement.

July 1, 1902, balance unexpended .....	\$105,857.32
June 30, 1903, amount expended during fiscal year .....	13,301.68
July 1, 1903, balance unexpended .....	92,555.64
July 1, 1903, amount covered by uncompleted contracts.....	85,500.21
Amount that can be profitably expended in fiscal year ending June 30, 1905, for maintenance of improvement, in addition to the balance unexpended July 1, 1903.....	
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	
	11,770.00

## APPROPRIATIONS.

Act of—		Act of—	
June 23, 1866 .....	\$30,500.00	July 5, 1884.....	\$10,000.00
March 2, 1867 .....	45,000.00	August 5, 1886 .....	7,000.00
July 25, 1868 (allotted) ..	17,500.00	August 11, 1888 .....	10,000.00
April 10, 1869 (allotted) ..	44,550.00	September 19, 1890 .....	10,000.00
July 11, 1870.....	17,500.00	July 13, 1892.....	25,000.00
March 3, 1871.....	17,500.00	August 18, 1894 .....	25,000.00
March 3, 1873.....	20,000.00	June 3, 1896 .....	25,000.00
June 23, 1874 .....	10,000.00	July 19, 1897.....	5,000.00
March 3, 1875.....	10,000.00	March 3, 1899 .....	28,600.00
August 14, 1876 .....	8,000.00	June 13, 1902 .....	105,600.00
June 18, 1878 .....	5,000.00	Miscellaneous receipts credited to appropriations.....	52.50
March 3, 1879 .....	4,000.00		
June 14, 1880 .....	6,000.00		
March 3, 1881.....	5,000.00		
August 2, 1882 .....	20,000.00	Total .....	511,802.50

## CONTRACT IN FORCE.

For dredging 800,000 cubic yards, at 12 cents per cubic yard.  
 Name of contractor: Samuel O. Dixon  
 Date of contract: August 25, 1902.  
 Date of approval: September 4, 1902.  
 Date of commencement: September 10, 1902.  
 Date for completion: January 3, 1904.

## COMMERCIAL STATISTICS FOR THE CALENDAR YEAR ENDING DECEMBER 31, 1902.

[Furnished by Mr. M. J. McCormick.]

### Arrivals and departures of vessels.

Description.	Arrivals.	Departures.
Steam and sail .....	1,391	1,440

### By way of the harbor.

	Tons.
Exports .....	497,970
Imports .....	637,528
Total .....	1,135,498
Tonnage in calendar year ending December 31, 1901.....	1,159,926
Decrease in 1902 .....	24,428

*Principal articles of export.*—Grain, flour, fish, lumber, and general merchandise.  
*Principal articles of import.*—Coal, salt, pulp wood, and general merchandise.



## L L 4.

IMPROVEMENT OF STURGEON BAY AND LAKE MICHIGAN SHIP CANAL  
AND HARBOR OF REFUGE CONNECTED THEREWITH, WISCONSIN.

The natural condition of this work and projects for its improvement are described, and references for more extended information and maps, and for reports on examinations and surveys, are given in Annual Report of the Chief of Engineers for 1902, pages 441 and 2049.

*Operations during the fiscal year.*—Under the existing contract for dredging 1,500,000 cubic yards, more or less, and the removal of 3,000 cubic yards, more or less, of rock, dredging was begun May 25, resulting in the removal of 128,149 cubic yards of material to June 30, 1903. Drilling and blasting the rock was begun June 19, and is now in progress, but its removal by dredging has not yet begun.

By hire of labor and the purchase of materials in accordance with law, 786 linear feet of revetment was constructed and 40,203 cubic yards of material removed from the canal and harbor. A dredge and a pile driver owned by the Government were employed on this work.

*Condition of the improvement.*—The harbor piers are completed the full length contemplated. Revetments have been completed on each side of the canal for its entire length. (Two hundred and thirty-four feet on the south side of the canal at its eastern end have been removed for the purpose of increasing it to the required width of 160 feet, and is now being rebuilt on the rectified line under an allotment for that purpose for "Operating and care.")

The channels in the canal and in the harbor are 15 feet and 17 feet deep below datum, respectively. Work under the existing project is not yet far enough advanced to have increased the navigable depths.

*Proposed operations.*—It is proposed to apply available balances in dredging and rock removal under the existing contract for securing a channel 21 feet deep, and in the renewal of about 1,100 feet of the harbor piers above the water line in accordance with the approved project.

*Remarks.*—It is believed that the funds available are sufficient to complete the work outlined; therefore no additional estimate is submitted.

*Money statement.*

July 1, 1902, balance unexpended .....	\$45,503.39
Miscellaneous receipts .....	11,593.90
Amount appropriated by sundry civil act of March 3, 1903.....	178,000.00
	<hr/>
	235,097.29
June 30, 1903, amount expended during fiscal year .....	13,642.45
	<hr/>
July 1, 1903, balance unexpended .....	221,454.84
July 1, 1903, outstanding liabilities .....	139.01
	<hr/>
July 1, 1903, balance available .....	221,315.83
	<hr/>
July 1, 1903, amount covered by uncompleted contracts.....	163,969.55

# 1842 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

## APPROPRIATIONS.

Act of—		Act of—	
March 3, 1873 .....	\$40,000.00	August 18, 1894 .....	\$25,000.00
March 23, 1874 .....	10,000.00	June 3, 1896 .....	35,000.00
June 18, 1878 .....	30,000.00	March 3, 1899 .....	35,500.00
March 3, 1879 .....	30,000.00	June 13, 1902 .....	44,000.00
June 14, 1880 .....	10,000.00	March 3, 1903 .....	178,000.00
March 3, 1881 .....	10,000.00	Miscellaneous receipts	
August 2, 1882 .....	20,000.00	credited to appropri-	
July 5, 1884 .....	10,000.00	tions .....	11,883.55
August 5, 1886 .....	5,000.00		
September 19, 1890 .....	3,000.00	Total .....	584,216.55
July 13, 1892 .....	<sup>a</sup> 86,833.00		

## CONTRACT IN FORCE.

For dredging 1,500,000 cubic yards, at 9.9 cents per cubic yard, and for 3,000 cubic yards of rock removal, at \$5.50 per cubic yard.

Name of contractor: Duluth Dredge and Dock Company.

Date of contract: March 28, 1903.

Date of approval: April 11, 1903.

Date of commencement: May 25, 1903.

Date for completion: December 31, 1904.

## COMMERCIAL STATISTICS FOR THE CALENDAR YEAR ENDING DECEMBER 31, 1902.

[Furnished by Mr. Adam N. Dier, superintendent Sturgeon Bay and Lake Michigan Ship Canal, Wisconsin.]

### Arrivals and departures of vessels.

Class.	Bound down.		Bound up.		Total.	
	Number.	Net tons.	Number.	Net tons.	Number.	Net tons.
1902:						
Steam .....	1,017	557,347	952	474,755	1,969	1,032,102
Sail .....	460	60,513	414	45,671	874	106,184
Unrigged .....	231	251,101	226	251,827	457	502,928
Total .....	1,708	868,961	1,592	771,753	3,300	1,640,714
1901 .....	1,986	922,652	1,776	764,666	3,752	1,687,318
1900 .....	1,760	749,944	1,693	684,927	3,453	1,434,871
1899 .....	2,015	785,378	1,825	631,734	3,840	1,417,112
1898 .....	1,921	669,641	1,855	616,244	3,775	1,285,885
1897 .....	2,283	864,642	2,131	821,339	4,414	1,685,981

Navigation through the canal for the season of 1902 was resumed April 4 and was practically closed December 16, a period of 257 days.

Average number of craft passing through the canal per day for the whole season (not including tugs) .....	12.84
Average net tons passing through canal per day for the whole season (not including tonnage of tugs) .....	6,384.10
Average net tonnage of—	
Steam craft .....	524.18
Sail craft .....	121.49
Unrigged craft .....	1,099.40

<sup>a</sup> Purchase, \$81,833.

*Statement of freight and passengers carried through the canal during the calendar year ending December 31, 1902.*

## BOUND DOWN.

Articles.	Net tons.	Articles.	Net tons.
Agricultural implements .....	565	Lumber .....	495
Coal .....	22,614	Merchandise (general) .....	61,254
Fish .....	703	Posts (fence and paving) .....	96
Flour .....	166	Salt .....	3,744
Fruit .....	563	Wood .....	325
Grain (all kinds) .....	2,026		
Iron (manufactured) .....	4,799	Total .....	97,724
Logs .....	375	Passengers .....	number.. 8,556

## BOUND UP.

Bark .....	1,983	Merchandise (general) .....	21,752
Coal .....	470	Paper .....	400
Dairy products .....	384	Poles (telegraph) .....	16,240
Fish .....	2,298	Posts (fence and paving) .....	3,595
Flour .....	645	Potatoes .....	893
Grain (all kinds) .....	1,713	Salt .....	522
Hay .....	185	Sawdust .....	470
Hides .....	638	Stone (building and crib) .....	72,885
Iron:		Ties (railroad) .....	17,892
Manufactured .....	1,391	Trees .....	80
Pig .....	540	Wood .....	14,545
Scrap .....	884		
Logs .....	4,750	Total .....	541,111
Lumber .....	375,956	Passengers .....	number.. 7,306

Total number of net tons of freight carried through the canal during the calendar year ending December 31, 1902, 638,835.

Total number of passengers carried through the canal during the calendar year ending December 31, 1902, 15,861.

*Statement showing quantity and estimated value of freight carried through the canal during the calendar year ending December 31, 1902.*

Items.	Quantity.	Price per unit.	Total valuation.
Agricultural implements .....	tons.. 565	\$200.00	\$113,000.00
Bark .....	cords.. 793	7.50	5,947.50
Coal .....	tons.. 23,084	4.50	103,878.00
Dairy products .....	do.. 384	250.00	96,000.00
Fish .....	do.. 3,001	100.00	300,100.00
Flour .....	barrels.. 7,500	5.00	37,500.00
Fruit .....	tons.. 563	60.00	33,780.00
Grain:			
Corn .....	bushels.. 17,000	.85	14,450.00
Oats .....	do.. 50,000	.30	15,000.00
Pease .....	do.. 61,100	1.25	76,375.00
Wheat .....	do.. 21,000	.70	14,700.00
Hay .....	tons.. 185	12.00	2,220.00
Hides .....	do.. 638	130.00	82,940.00
Iron:			
Manufactured .....	do.. 6,190	62.50	386,875.00
Pig .....	do.. 540	30.00	16,200.00
Scrap .....	do.. 884	6.00	5,304.00
Logs .....	M feet B. M.. 2,050	15.00	30,750.00
Lumber .....	do.. 250,967	22.00	5,521,274.00
Merchandise (general) .....	tons.. 83,006	175.00	14,526,050.00
Paper .....	do.. 400	60.00	24,000.00
Poles (telegraph) .....	number.. 92,800	3.00	278,400.00
Posts (fence and paving) .....	do.. 194,200	.20	38,840.00
Potatoes .....	bushels.. 29,750	.65	19,337.50
Salt .....	barrels.. 28,441	1.10	31,285.10
Sawdust .....	tons.. 470	3.50	1,645.00
Stone (building and crib) .....	do.. 72,885	.95	69,240.75
Ties (railroad) .....	number.. 225,600	.30	67,680.00
Trees .....	do.. 4,000	.60	2,400.00
Wood .....	cords.. 5,948	5.50	32,714.00
Total value .....			21,947,885.50

# 1844 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

*Comparative statement of principal items of commerce through the canal for the calendar years 1901 and 1902.*

Items.	Year.		Increase.	Decrease.
	1901.	1902.		
Vessels.....number.....	3,752	3,900		452
Tonnage.....tons.....	1,687,318	1,640,714		46,604
Tonnage (cargo).....do.....	906,138	688,835		267,303
Passengers.....number.....	16,241	15,861		380
Agricultural implements.....tons.....	645	565		80
Coal.....do.....	74,859	23,084		51,775
Fish.....do.....	2,062	3,001	949	
Flour.....barrels.....	63,030	7,500		55,530
Grain (all kinds).....bushels.....	369,128	149,100		220,028
Hay.....tons.....	2,181	185		1,996
Iron:				
Manufactured.....do.....	12,823	6,190		6,633
Pig.....do.....	3,335	540		2,795
Lumber.....M ft. B. M.....	345,913	250,967		94,946
Merchandise (general).....tons.....	63,063	83,006	19,923	
Poles (telegraph).....number.....	200,700	92,800		107,900
Posts (fence and paving).....do.....	216,100	194,200		21,900
Potatoes.....barrels.....	6,000	9,917	3,917	
Salt.....do.....	46,922	28,441		18,481
Stone (building and crib).....tons.....	101,260	72,886		28,375
Ties (railroad).....number.....	294,450	225,600		68,850
Wood.....cords.....	11,336	5,948		5,388

Estimated value of freight passing through the canal during the calendar year ending December 31, 1902..... \$21,947,885.85

Estimated value of freight passing through the canal during the calendar year ending December 31, 1901..... 22,469,101.85

Decrease in value of freight in 1902 as compared with 1901 .... 521,216.00

*Statement showing number and net tonnage of tugs passing through the canal during the calendar year ending December 31, 1902, and the number of vessels and unrigged craft towed during that time.*

## BOUND DOWN.

Month.	Number.	Net tons.	Vessels towed.	Unrigged towed.
April.....	26	708	7	8
May.....	27	918	13	9
June.....	29	1,067	11	12
July.....	49	1,483	11	32
August.....	36	1,027	12	14
September.....	43	1,148	22	11
October.....	70	1,789	18	5
November.....	55	1,280	8	5
December.....	42	1,044		1
Total.....	377	10,454	102	97

## BOUND UP.

April.....	20	598	6	4
May.....	32	912	19	5
June.....	28	1,080	9	10
July.....	49	1,378	13	32
August.....	34	956	12	12
September.....	42	1,123	19	10
October.....	69	1,763	11	6
November.....	50	1,120	10	4
December.....	48	999	2	0
Total.....	367	9,919	101	88

Total number of trips made through canal by tugs for whole season..... 744  
Total number of net tons ..... 20,373  
Total number of vessels towed ..... 203  
Total number of unrigged craft towed ..... 180  
Total number of vessels and unrigged craft towed ..... 383

Average net tonnage of tugs stationed at canal .....	28
Average number passing through canal per day for whole season .....	2. 70
Number of tugs stationed at canal engaged in local towing .....	4
Net tonnage of tugs stationed at canal for local towing .....	111
Length of towing route from harbor entrance to mouth of Sturgeon Bay .....	8. 75

*Statement of class and net tonnage of vessels coming in from the lake via the canal during the year to seek shelter in Sturgeon Bay from storms.*

Month.	Steam.		Sail.		Unrigged.		Total.	
	Number.	Net tons.	Number.	Net tons.	Number.	Net tons.	Number.	Net tons.
January.....	3	2,660					3	2,660
February.....								
March.....	1	1,677					1	1,677
April.....	6	2,740	8	1,237	2	2,200	16	6,177
May.....	4	1,888	19	1,921			23	3,809
June.....	2	506	17	1,918	1	1,200	20	3,624
July.....	8	1,704	35	2,386	3	3,200	46	7,290
August.....	5	1,340	24	1,743			29	3,083
September.....	4	1,299	24	5,091	1	300	29	6,690
October.....	7	1,893	20	2,024	3	3,663	30	7,580
November.....	3	561	17	2,719	1	1,200	21	4,480
December.....	5	3,788	4	856			9	4,644
Total.....	48	20,056	168	19,895	11	11,763	227	51,714

Average net tonnage of steam craft sheltered .....	417. 83
Average net tonnage of sail craft sheltered .....	118. 42
Average net tonnage of unrigged craft sheltered .....	1, 069. 36

*Class, quantity, and estimated value of cargoes carried by vessels while sheltered in Sturgeon Bay, season of 1902, only those coming in from the lake via the canal being included.*

Items.	Quantity.	Price per unit.	Total valuation.
Logs..... M feet B. M.	700	\$15. 00	\$10, 500
Lumber..... do.	22, 096	22. 00	486, 112
Poles (telegraph)..... number.	250	3. 00	750
Posts (fence and paving)..... do.	58, 300	. 20	11, 660
Salt..... barrels.	2, 000	1. 10	2, 200
Shingles..... M.	1, 440	2. 00	2, 880
Stone (building and crib)..... tons.	6, 320	. 95	6, 004
Ties (railroad)..... number.	14, 000	. 30	4, 200
Wood..... cords.	1, 052	5. 50	5, 786

Total estimated value of cargo carried by craft sheltered .....	\$530, 092
Total estimated value of vessels sheltered (based on Lloyd's valuation and is approximate).....	2, 492, 530

Total value of vessels and cargo..... 3, 022, 622

*Principal lines of transportation using the canal during the past year and number and net tonnage of boats comprising each line.*

Name of line.	Port of hail.	Number of boats.	Net tonnage.
Toledo, Ann Arbor and Northern Michigan R. R.	Toledo, Ohio .....	3	3, 959
Lake Michigan Car Ferry Transportation Co.	Chicago, Ill. ....	4	3, 723
Goodrich Transportation Co.	do .....	7	5, 411
Barry Bros. Transportation Co.	do .....	4	8, 831
Edward Hines Lumber Co.	do .....	7	2, 453
Arthur Gurley Lumber Co.	do .....	4	1, 361
John Schroeder Lumber Co.	Milwaukee, Wis. ....	3	699
Hart's Steamboat Line	Green Bay, Wis. ....	3	1, 315
Leathem & Smith Towing and Wrecking Co.	Sturgeon Bay, Wis. ....	16	6, 778
Packard, Smith & Co.	do .....	1	796
George Pankratz Lumber Co.	do .....	2	730
Termensen & Jensen	do .....	5	1, 730
Total .....		59	32, 846

# 1846 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

Of the foregoing lines of transportation, the Toledo, Ann Arbor and Northern Michigan Railroad Company, the Goodrich Transportation Company, Barry Bros. Transportation Company, and Hart's Steamboat Line carry both freight and passengers; the other lines freight only.

In addition to the foregoing lines of transportation, a large number of steam barges, sail vessels, and unrigged craft engaged in the general freighting business make use of the canal continually, going both ways during the season of navigation, and a large local business is done by tugs engaged in assisting sail vessels, unrigged craft, etc., through the canal.

## L L 5.

### OPERATING AND CARE OF STURGEON BAY AND LAKE MICHIGAN SHIP CANAL, WISCONSIN.

*Operations during the fiscal year.*—Operations have been confined to work incident to operating and care, examinations, keeping record of vessels and tonnage passing through the canal, and making necessary repairs for maintenance, including the removal of 234 linear feet of the south revetment and rebuilding it on the rectified line. This latter is now in progress.

*Condition of the improvement.*—Navigation through the canal opened April 4, 1902. Closed on account of ice formation December 16, and was resumed March 16, 1903. There is a depth of 15 feet below datum in the canal, and a contract is in force to increase its depth to 21 feet, to be completed by December 31, 1904. Work in furtherance of the contract was begun May 25, 1903, and is being vigorously prosecuted.

*Proposed operations.*—It is proposed to apply the funds for which an allotment is requested in maintenance, operating and care, and supervision of existing works, including the completion of 234 linear feet of south revetment, which is now in progress.

In accordance with the provisions of section 4 of river and harbor act of July 5, 1884, a summary of expenditures is herewith given.

#### *Money statement.*

July 1, 1902, balance unexpended .....	\$1,739.89
Amount allotted for fiscal year ending June 30, 1903.....	14,867.67
Miscellaneous receipts .....	80.11
	<hr/>
June 30, 1903, amount expended during fiscal year .....	16,687.67
	<hr/>
July 1, 1903, balance unexpended .....	9,342.52
July 1, 1903, outstanding liabilities .....	500.00
	<hr/>
July 1, 1903, balance available .....	8,842.52
Amount (estimated) for expenditure in fiscal year ending June 30, 1904 <sup>a</sup> .....	7,937.98
	<hr/>
Amount available for fiscal year ending June 30, 1904.....	16,780.50

<sup>a</sup> Amount allotted if estimate is approved.







*Allotments from appropriation for operating and care of canals and other works of navigation, indefinite, act of July 5, 1884, applied to Sturgeon Bay and Lake Michigan Ship Canal, Wisconsin.*

May 5, 1893 .....	\$1,415.83	September 19, 1899 .....	\$7,500.00
July 22, 1893 .....	20,500.00	January 27, 1900 .....	1,000.00
July 19, 1894 .....	10,301.13	July 17, 1900 .....	37,515.54
July 20, 1895 .....	12,359.66	July 19, 1901 .....	8,501.68
August 10, 1896 .....	17,513.84	July 21, 1902 .....	14,867.67
July 21, 1897 .....	12,873.77	Miscellaneous receipts cred-	
July 28, 1898 .....	27,435.79	ited to appropriations .....	325.67
September 16, 1898 .....	3,000.00		
July 24, 1899 .....	23,551.29	Total .....	198,661.87

*Summary of expenditures made from appropriation for operating and care of canals and other works of navigation, indefinite, act of July 5, 1884, applied to Sturgeon Bay and Lake Michigan Ship Canal, Wisconsin, during the fiscal year ending June 30, 1903.*

Services .....	\$5,508.90
Supplies .....	850.74
Materials .....	916.74
Miscellaneous .....	68.77
Total .....	7,345.15

## L L 6.

### IMPROVEMENT OF AHNAPEE HARBOR, WISCONSIN.

The natural condition of this work and projects for improvement are described, and references for more extended information and for reports on examinations and surveys are given in Annual Report of the Chief of Engineers for 1902, page 442.

*Operations during the fiscal year.*—By hire of labor and the use of U. S. dredge No. 2 dredging was begun October 18 and completed November 14, 1902. During this period 7,010 cubic yards of material were removed from the channel.

*Condition of the improvement.*—The piers are completed the full length contemplated. Three hundred and fifty feet of the north pier require renewal above the water line; otherwise they are in fair condition.

The depth below datum is 16 feet at the harbor entrance, thence 13 feet for a minimum width of about 60 feet to the shore end of the piers. Thence to the bridge, a distance of 800 feet, rock has been removed to obtain a channel 100 feet wide. About one-third of the area has this required depth of 13 feet and the remaining two-thirds a depth of about 10 feet.

The 50-foot channel in continuation of the present channel up the river is not yet of the projected length or width. For a distance of about 520 feet it has a depth of 10 feet and least width of 30 feet.

See also accompanying map.

*Proposed operations.*—It is proposed to apply available balances and appropriation recommended in completing the existing project and in maintenance of existing works.

# 1848 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

The estimate for maintenance of existing works for the fiscal year ending June 30, 1905, is as follows:

For dredging 20,000 cubic yards, at 12 cents.....	\$2, 400
For minor repairs to piers.....	1, 600
Contingencies, 10 per cent .....	400
Total .....	4, 400

## Money statement.

July 1, 1902, balance unexpended .....	\$10, 836. 27
June 30, 1903, amount expended during fiscal year .....	1, 436. 58
July 1, 1903, balance unexpended .....	9, 399. 69
Amount (estimated) required for completion of existing project .....	6, 266. 00
Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903:	
For works of improvement.....	\$6, 266. 00
For maintenance of improvement .....	4, 400. 00
	10, 666. 00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

## APPROPRIATIONS.

Act of—		Act of—	
March 3, 1871 .....	\$25, 000	August 11, 1888 .....	\$5, 000
June 10, 1872 .....	25, 000	September 19, 1890 .....	6, 000
March 3, 1875 .....	25, 000	July 13, 1892.....	7, 000
August 14, 1876 .....	8, 000	August 18, 1894 .....	5, 000
June 18, 1878 .....	8, 000	June 3, 1896 .....	5, 000
March 3, 1879 .....	7, 000	March 3, 1899.....	13, 000
June 14, 1880 .....	7, 000	June 13, 1902 .....	10, 000
March 3, 1881 .....	8, 000	Miscellaneous receipts credited	
August 2, 1882 .....	12, 000	to appropriations .....	220
July 5, 1884 .....	15, 000		
August 5, 1886 .....	15, 000	Total .....	206, 220

## COMMERCIAL STATISTICS FOR THE CALENDAR YEAR ENDING DECEMBER 31, 1902.

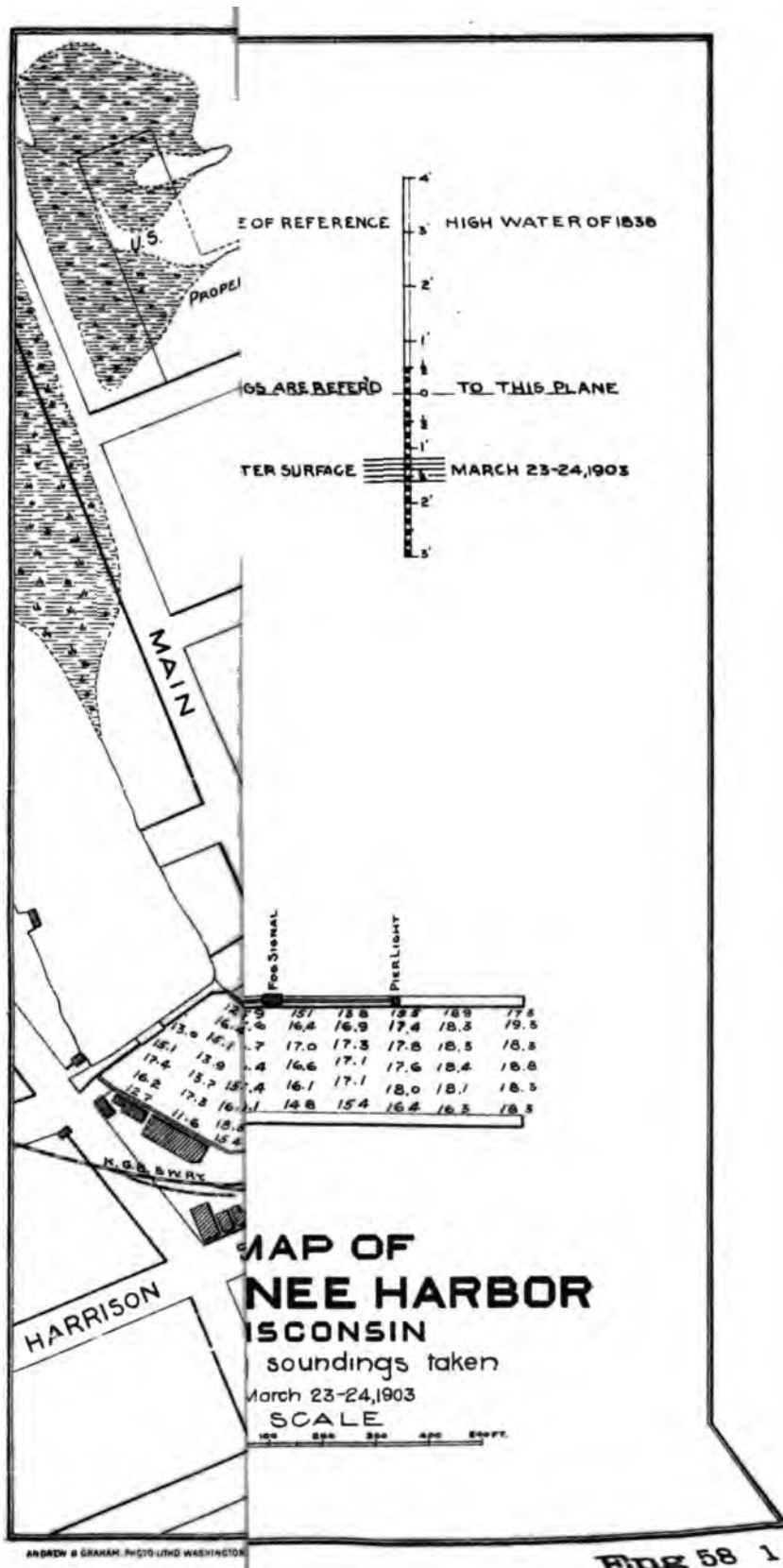
Efforts were made to obtain the commercial statistics for Ahnapee Harbor for the year, but none could be obtained.

## L L 7.

### IMPROVEMENT OF KEWAUNEE HARBOR, WISCONSIN.

The natural condition of this harbor and project for its improvement is described and references for more extended information and for report on examination and survey are given in Annual Report of the Chief of Engineers for 1902, page 443.

*Operations during the fiscal year.*—By hire of labor and the use of U. S. dredges Nos. 1 and 2 dredging was begun November 18, 1902, suspended December 8, resumed April 17, 1903, and closed May 4.





During this period 18,185 cubic yards of material were excavated, resulting in increasing the width of the 15-foot entrance from 80 feet to 110 feet and the removal of several small shoals from the basin. Dredge No. 1, dump scows, and tug *Industry* were repaired at the Government wharf and yard during the winter of 1902 and 1903.

Soundings were taken and a map of the harbor prepared.

*Condition of the improvement.*—The piers are built the full length contemplated and are in fair condition, with the exception of 1,100 linear feet that requires renewal above the water line.

The channel has the required depth of 15 feet below datum, with a minimum width of 110 feet. See also accompanying map.

*Proposed operations.*—It is proposed to apply the funds available and the additional appropriation recommended for maintenance of existing works by making needed repairs to the piers and in dredging.

*Estimate for fiscal year ending June 30, 1905.*

For dredging 20,000 cubic yards for maintenance of channel, at 10 cents.....	\$2,000
For minor repairs to harbor piers.....	2,000
Contingencies, 10 per cent.....	400
Total .....	4,400

*Money statement.*

July 1, 1902, balance unexpended .....	\$11,529.48
June 30, 1903, amount expended during fiscal year .....	2,967.37
July 1, 1903, balance unexpended .....	8,562.11
Amount that can be profitably expended in fiscal year ending June 30, 1905, for maintenance of improvement, in addition to the balance unexpended July 1, 1903 .....	
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	
	4,400.00

APPROPRIATIONS.

Act of—		Act of—	
March 3, 1881 .....	\$5,000.00	June 3, 1896 .....	\$25,000.00
August 2, 1882 .....	12,000.00	March 3, 1899 .....	8,800.00
July 5, 1884 .....	18,000.00	June 13, 1902 .....	11,000.00
August 5, 1886 .....	10,000.00	Miscellaneous receipts	
August 11, 1888 .....	10,000.00	credited to appropri-	
September 19, 1890 .....	20,000.00	tions .....	52.19
July 13, 1892 .....	30,000.00		
August 18, 1894 .....	20,000.00	Total .....	169,852.19

Appropriated by local authorities in 1881 and expended by the United States under the direction of the engineer officer in charge, \$8,042.72.

COMMERCIAL STATISTICS FOR THE CALENDAR YEAR ENDING DECEMBER 31, 1902.

[Furnished by the mayor of Kewaunee, Wis.]

*Arrivals and departures of vessels.*

Description.	Arrivals.	Departures.
Steam .....	1,213	1,213
Sail .....	176	176
Total .....	1,388	1,388

# 1850 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

*By way of the harbor.*

	Tons.
Exports .....	804, 062
Imports .....	203, 503
Total .....	1, 007, 565
Tonnage in calendar year ending December 31, 1901.....	725, 768
Increase in 1902.....	281, 797

*Principal articles of export.*—Flour, hay, mill stuffs, grain, and general merchandise.

*Principal articles of import.*—Mill stuffs, coal, grain, and lumber.

## L L 8.

### IMPROVEMENT OF TWO RIVERS HARBOR, WISCONSIN.

The natural condition of this harbor and projects for its improvement are described, and references for more extended information and for report on examination and survey are given in Annual Report of the Chief of Engineers for 1902, page 444.

*Operations during the fiscal year.*—By hire of labor and the use of U. S. dredge No. 1, dredging was begun September 8 and completed November 12, 1902. During this period 25,379 cubic yards were removed from the channel and from the outer bar.

Soundings were taken and a map of the harbor prepared.

A contract was entered into with Frankman Bros. & Morris for repairing 1,800 feet, more or less, of the pile piers. This contract is dated June 13, 1903, to be completed December 31, 1903. Only preparatory work has been done on it during the fiscal year.

*Condition of the improvement.*—April 8, 1903, the channel had the required depth of 13 feet below datum for a minimum width of about 150 feet. Probably no material change has occurred since then. About 2,000 linear feet of the inshore portion of the piers require extensive repairs. The remaining portion is in fair condition.

See also accompanying map.

*Proposed operations.*—It is proposed to apply available balance and additional appropriation recommended in repairing the piers and dredging for the maintenance of the channel.

For maintenance of existing works for the fiscal year ending June 30, 1905, the following estimate is submitted:

For dredging 30,000 cubic yards, at 12 cents.....	\$3, 600
For repairs to piers.....	2, 400
Contingencies, 10 per cent .....	600
Total .....	6, 600

### *Money statement.*

July 1, 1902, balance unexpended .....	\$20, 481. 00
June 30, 1903, amount expended during fiscal year .....	3, 172. 16
July 1, 1903, balance unexpended .....	17, 308. 84

Amount that can be profitably expended in fiscal year ending June 30, 1905, for maintenance of improvement, in addition to the balance unexpended July 1, 1903.....	6, 600. 00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	







## APPROPRIATIONS.

Act of—		Act of—	
March 3, 1871 .....	\$25,000	July 5, 1884 .....	\$8,000
June 10, 1872 .....	25,000	August 11, 1888 .....	2,500
March 3, 1873 .....	25,000	September 19, 1890 .....	3,000
June 23, 1874 .....	15,000	July 13, 1892 .....	3,000
March 3, 1875 .....	15,000	August 18, 1894 .....	3,000
August 14, 1876 .....	5,000	June 3, 1896 .....	5,000
June 18, 1878 .....	10,000	March 3, 1899 .....	8,000
March 3, 1879 .....	20,000	June 13, 1902 .....	20,000
June 14, 1880 .....	20,000		
March 3, 1881 .....	15,000	Total .....	242,500
August 2, 1882 .....	15,000		

## CONTRACT IN FORCE.

For construction of 1,800 linear feet, more or less, of pile revetment, material to be paid for at the following rates: Round piles at 27 cents per linear foot; Wakefield sheet piling of Norway pine plank, at \$33 per thousand feet B. M.; Norway pine timber, at \$32 per thousand feet B. M.; pine plank, at \$32 per thousand feet B. M.; wrought iron drift bolts, at 4 cents per pound; wrought iron screw bolts and tie-rods, at 4 cents per pound; wrought iron and wire spikes, at 4 cents per pound.

Name of contractor: Frankman Bros. & Morris.

Date of contract: June 13, 1903.

Date of approval: July 9, 1903.

Date of commencement: July 15, 1903.

Date for completion: December 31, 1903.

## COMMERCIAL STATISTICS FOR THE CALENDAR YEAR ENDING DECEMBER 31, 1902.

[Furnished by the mayor of Two Rivers, Wis.]

*Arrivals and departures of vessels.*

Description.	Arrivals.	Departures.
Steam .....	268	268
Sail .....	106	106
Total .....	373	373

*By way of the harbor.*

	Tons.
Exports .....	1,741
Imports .....	18,459
Total .....	20,200

*Principal articles of export.*—Printers' goods, hay, peas, and oats.

*Principal articles of import.*—Lumber, stone, and general merchandise.

## L L 9.

## IMPROVEMENT OF MANITOWOC HARBOR, WISCONSIN.

The original condition of this harbor and projects for its improvement are described, and reference for more extended information and for reports on examination and surveys are given in Annual Report of the Chief of Engineers for 1902, page 444.

# 1852 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

*Operations during the fiscal year.*—Minor repairs were made to the harbor piers. Under the existing contract for extending the breakwater 400 feet work was begun May 12, and at the close of the fiscal year Crib Nos. 1 and 2, each 100 feet long, were built 15½ feet and 2½ feet high, respectively, but no cribs have yet been sunk in place.

To comply with the provisions of an item in act approved June 13, 1902, a survey of Manitowoc harbor and river was made, and report thereon, dated July 13, 1903, with plans and estimate of cost for the formation of two turning basins in the river and increasing the depth of channel to 21 feet, is submitted herewith in Appendix L L 19.

*Condition of the improvement.*—April 8, 1903, the channel had the required depth of 20 feet for a minimum width of 100 feet. Probably no material change has occurred since then. About 750 linear feet of the harbor piers require renewal above the water line. Otherwise they are in good condition.

*Proposed operations.*—It is proposed to apply available balances and additional appropriation recommended in completing the extension of the breakwater and for maintenance of existing works by dredging and repairing the piers.

## Estimate for fiscal year ending June 30, 1905.

For dredging 20,000 cubic yards, for maintenance of channel, at 12 cents . . . .	\$2, 400
For minor repairs to harbor piers . . . . .	2, 000
Contingencies, 10 per cent . . . . .	440
Total . . . . .	4, 840

## Money statement.

July 1, 1902, balance unexpended . . . . .	\$46, 984. 97
June 30, 1903, amount expended during fiscal year . . . . .	3, 226. 44
July 1, 1903, balance unexpended . . . . .	43, 758. 53
July 1, 1903, amount covered by uncompleted contracts . . . . .	35, 000. 00
Amount that can be profitably expended in fiscal year ending June 30, 1905, for maintenance of improvement, in addition to the balance unexpended July 1, 1903 . . . . .	4, 840. 00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

## APPROPRIATIONS.

Act of—		Act of—	
August 30, 1852 . . . . .	\$8, 000. 00	August 2, 1882 . . . . .	\$10, 000. 00
June 23, 1866 . . . . .	52, 000. 00	July 5, 1884 . . . . .	15, 000. 00
March 2, 1867 . . . . .	45, 000. 00	August 5, 1886 . . . . .	15, 000. 00
July 25, 1868 (allotted) . . . . .	17, 500. 00	August 11, 1888 . . . . .	8, 000. 00
April 10, 1869 (allotted) . . . . .	17, 820. 00	September 19, 1890 . . . . .	8, 000. 00
July 11, 1870 . . . . .	20, 000. 00	July 13, 1892 . . . . .	28, 000. 00
March 3, 1871 . . . . .	11, 000. 00	August 18, 1894 . . . . .	20, 000. 00
March 3, 1873 . . . . .	20, 000. 00	June 3, 1896 . . . . .	44, 440. 00
June 23, 1874 . . . . .	10, 000. 00	March 3, 1899 . . . . .	3, 300. 00
March 3, 1875 . . . . .	10, 000. 00	June 13, 1902 . . . . .	45, 000. 00
August 14, 1876 . . . . .	8, 000. 00	Miscellaneous receipts	
June 18, 1878 . . . . .	15, 000. 00	credited to appropria-	
March 3, 1879 . . . . .	6, 500. 00	tions . . . . .	252. 72
June 14, 1880 . . . . .	7, 000. 00		
March 3, 1881 . . . . .	4, 000. 00	Total . . . . .	448, 812. 72

## CONTRACT IN FORCE.

For construction of 400 feet of crib breakwater, material to be paid for at the following rates: Foundation and protection piles at \$12 each; stone at 95 cents per ton; long-leaved yellow or Southern pine timber at \$31.50 per 1,000 feet B. M.; hemlock timber at \$24.50 per 1,000 feet B. M.; pine plank at \$34 per 1,000 feet B. M.; hemlock plank at \$33 per 1,000 feet B. M.; wrought-iron drift bolts at 5 cents per pound; wrought-iron screw bolts at 5 cents per pound; wrought-iron and wire spikes at 5 cents per pound.

Name of contractor: Adolph Green.

Date of contract: March 28, 1903.

Date of approval: April 9, 1903.

Date of commencement: May 9, 1903.

Date for completion: December 31, 1903.

## COMMERCIAL STATISTICS FOR THE CALENDAR YEAR ENDING DECEMBER 31, 1902.

[Furnished by Mr. W. G. Kemper, mayor of Manitowoc, Wis.]

*Arrivals and departures of vessels.*

Description.	Arrivals.	Departures.
Steam .....	1,757	1,753
Sail .....	249	250
Total .....	2,006	2,003

*By way of the harbor.*

	Tons.
Exports .....	378,684
Imports .....	426,285
Total .....	804,969
Tonnage in calendar year ending December 31, 1901 .....	12,248,675
Decrease in 1902 .....	11,443,706

*Principal articles of export.*—Grain, mill stuffs, lumber, iron and steel, and general merchandise.

*Principal articles of import.*—Coal, salt, wood, and general merchandise.

## L L 10.

## IMPROVEMENT OF SHEROYGAN HARBOR, WISCONSIN.

The original condition of this harbor and projects for its improvement are described and reference for more extended information and for reports on examinations and surveys are given in Annual Report of Chief of Engineers for 1902, page 445.

*Operations during the fiscal year.*—By hire of labor and use of U. S. dredge No. 1 dredging in furtherance of increasing the depth of channel to 21 feet below datum was begun May 12, 1903, and is now in progress. During this period 12,230 cubic yards of material were removed from the channel and about 120 linear feet of the north pier removed preparatory to rebuilding it on the rectified line.

Work under the existing contract was begun May 9 and was in progress at the close of the fiscal year. Two cribs each 100 feet long were built 16½ feet in height and one crib of same length, 4½ feet high.

## 1854 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

*Condition of the improvement.*—The 21-foot channel has a minimum width of 60 feet and dredging for increasing its width is in progress.

The contract now in force provides for completing the piers to their required length. Urgent repairs to about 1,000 feet of the shore end of the north pier are in progress.

The breakwater is 600 feet long and requires an extension of 100 feet. See also accompanying map.

*Proposed operations.*—It is proposed to apply available balances and additional appropriation recommended in completing the 21-foot channel by dredging and by pier extension, completing repairs to the north pier, extending the breakwater 100 feet, in accordance with the approved project, and for maintenance of existing works.

The following estimate for completion of breakwater and maintenance of existing works for the fiscal year ending June 30, 1905, is recommended:

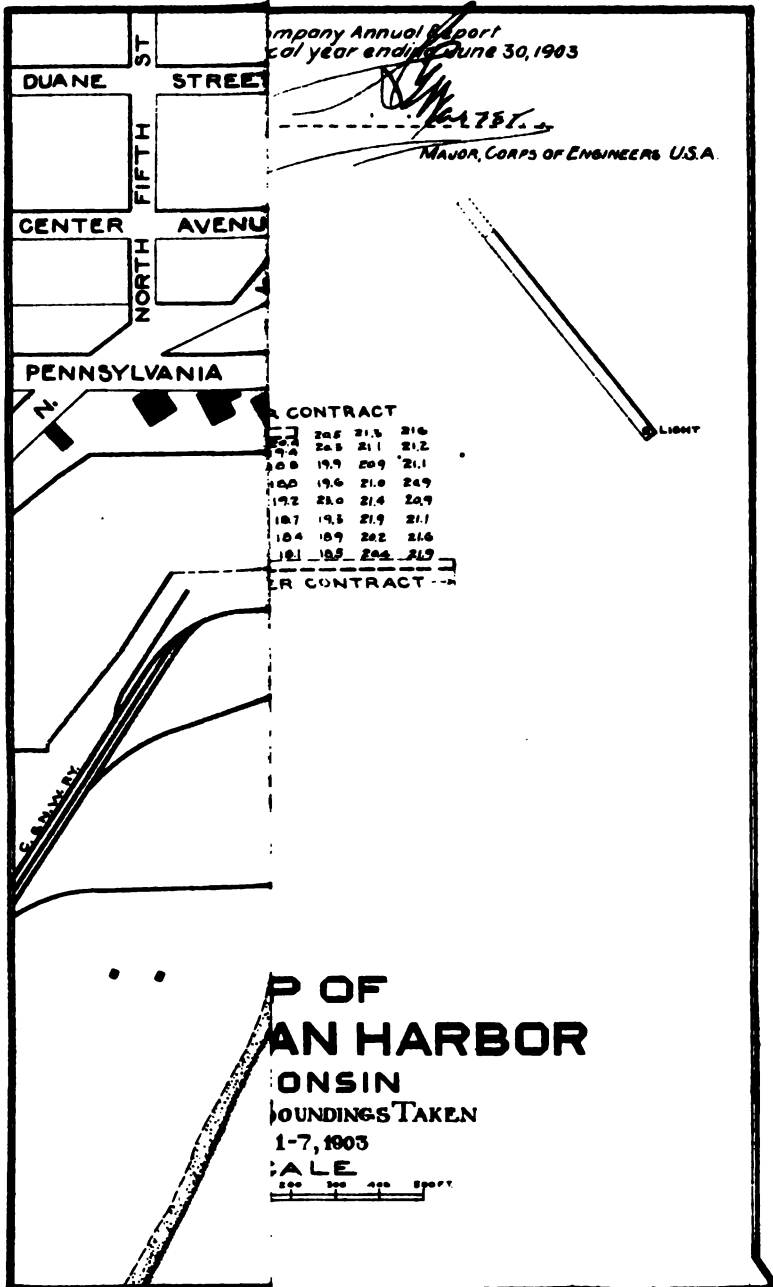
For tearing out 320 linear feet old pier and building 320 linear feet of pile revetment, at \$15.....	\$4,800
For 1 crib, 30 by 100 feet, to complete existing project for breakwater.....	11,500
For dredging 30,000 cubic yards, at 15 cents.....	4,500
For minor repairs to piers and breakwater .....	2,500
Contingencies and superintendence.....	2,300
Total .....	25,600

*Money statement.*

July 1, 1902, balance unexpended .....	\$93,094.91
June 30, 1903, amount expended during fiscal year .....	6,863.14
July 1, 1903, balance unexpended .....	86,231.77
July 1, 1903, outstanding liabilities.....	1,194.55
July 1, 1903, balance available .....	85,037.22
July 1, 1903, amount covered by uncompleted contracts.....	69,261.50
Amount (estimated) required for completion of existing project .....	11,500.00
Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903:	
For works of improvement.....	\$11,500.00
For maintenance of improvement .....	14,100.00
	25,600.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

## APPROPRIATIONS.

Act of—		Act of—	
August 30, 1852 .....	\$10,000.00	March 3, 1881 .....	\$25,000.00
June 28, 1864 (allotted) ..	10,000.00	August 2, 1882 .....	30,000.00
June 23, 1866 .....	47,598.91	July 5, 1884 .....	28,000.00
March 2, 1867 .....	8,000.00	August 5, 1886 .....	15,000.00
April 10, 1869 (allotted) ..	14,850.00	August 11, 1888 .....	15,000.00
July 11, 1870 .....	15,000.00	September 19, 1890 .....	15,000.00
March 3, 1871 .....	15,000.00	July 13, 1892 .....	25,000.00
June 10, 1872 .....	18,000.00	August 18, 1894 .....	25,000.00
March 3, 1873 .....	10,000.00	June 3, 1896 .....	26,000.00
June 23, 1874 .....	10,000.00	March 3, 1899 .....	28,400.00
March 3, 1875 .....	12,000.00	June 6, 1900 .....	52,000.00
August 14, 1876 .....	6,000.00	June 13, 1902 .....	90,000.00
June 18, 1878 .....	4,000.00		
March 3, 1879 .....	3,000.00	Total .....	564,848.91
June 14, 1880 .....	7,000.00		



ANDREW B. GRAHAM PHOTO LITHO WASHINGTON D.C.



## CONTRACT IN FORCE.

For construction of 200 feet north pier extension and 600 feet south pier extension, material to be paid for at the following rates: Foundation and protection piles at \$9.50 each; stone at 85 cents per ton; Douglas or Oregon fir and longleaf yellow or southern pine timber at \$34 per thousand feet B. M.; hemlock timber at \$23.75 per thousand feet B. M.; pine plank at \$32 per thousand feet B. M.; hemlock plank at \$20 per thousand feet B. M.; wrought-iron drift bolts at 3½ cents per pound; wrought-iron screw bolts at 3½ cents per pound; wrought iron and wire spikes at 4 cents per pound.

Name of contractor: Nelson J. Gaylord.  
 Date of contract: March 30, 1903.  
 Date of approval: April 13, 1903.  
 Date of commencement: May 9, 1903.  
 Date for completion: December 31, 1903.

## COMMERCIAL STATISTICS FOR THE CALENDAR YEAR ENDING DECEMBER 31, 1902.

[Furnished by Mr. William H. Devos, collector of customs, Milwaukee, Wis.]

*Arrivals and departures of vessels.*

Description.	Arrivals.	Departures.
Steam .....	995	998
Sail .....	323	324
Total .....	1,318	1,322

*By way of the harbor.*

	Tons.
Exports .....	594, 213
Imports .....	701, 505
Total .....	1, 295, 718
Tonnage in calendar year ending December 31, 1901 .....	1, 238, 677
Increase in 1902 .....	57, 041

*Principal articles of export.*—Chairs, coal and coke, furniture, lime and cement, lumber, salt, and general merchandise.

*Principal articles of import.*—Tan bark, coal and coke, lumber, salt, wood, and general merchandise.

## L L II.

## IMPROVEMENT OF PORT WASHINGTON HARBOR, WISCONSIN.

The natural condition of this harbor and projects for its improvement are described in the Annual Report of the Chief of Engineers for 1902, page 445. For more extended information and maps see Annual Report for 1893, page 2740, and 1896, page 2498.

For report on examination and survey see House Document No. 44, Fifty-sixth Congress, first session (and Annual Report for 1900, p. 3766).

*Operations during the fiscal year.*—By hire of labor and the use of U. S. dredge No. 1 dredging was begun August 15 and completed September 16, 1902. During this period 10,291 cubic yards were

# 1856 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

removed from the channel and basins and the required depth of 13 feet below datum was secured. Repairs were made to the dredging plant during the winter of 1902-3 at the Government yard at Kewaunee.

*Condition of improvement.*—The piers are built the full length contemplated and are in fair condition. The channel and basins have the required depth of 13 feet below datum.

See also accompanying map.

*Proposed operations.*—It is proposed to apply the balance available for maintenance of existing works in dredging and for repairs to piers as may be needed from time to time.

It is believed that the funds available are sufficient for these purposes to June 30, 1905; therefore no estimate for an additional appropriation is submitted.

## Money statement.

July 1, 1902, balance unexpended.....	\$7, 107. 86
June 30, 1903, amount expended during fiscal year.....	1, 480. 92
July 1, 1903, balance unexpended.....	5, 626. 94

## APPROPRIATIONS.

Act of—		Act of—	
July 11, 1870.....	\$15, 000. 00	August 5, 1886.....	\$5, 000. 00
March 3, 1871.....	15, 000. 00	September 11, 1888.....	5, 000. 00
June 10, 1872.....	15, 000. 00	September 19, 1890.....	3, 000. 00
March 3, 1873.....	15, 000. 00	July 13, 1892.....	6, 500. 00
June 23, 1874.....	10, 000. 00	August 18, 1894.....	5, 000. 00
March 3, 1875.....	10, 000. 00	June 3, 1896.....	5, 500. 00
August 14, 1876.....	8, 000. 00	March 3, 1899.....	4, 400. 00
June 18, 1878.....	5, 000. 00	June 13, 1902.....	6, 000. 00
March 3, 1879.....	7, 500. 00	Miscellaneous receipts credited to appropriations.....	36. 50
June 14, 1880.....	20, 000. 00		
March 3, 1881.....	17, 000. 00	Total.....	204, 936. 50
August 2, 1882.....	17, 000. 00		
July 5, 1884.....	10, 000. 00		

## COMMERCIAL STATISTICS FOR THE CALENDAR YEAR ENDING DECEMBER 31, 1902.

[Furnished by Mr. William C. Mitchell, harbor master.]

### Arrivals and departures of vessels.

Description.	Arrivals.	Departures.
Steam.....	1, 285	1, 285
Sail.....	69	69
Total.....	1, 354	1, 354

### By way of the harbor.

	Tons.
Exports.....	7, 035
Imports.....	58, 754
Total.....	65, 789
Tonnage in calendar year ending December 31, 1901.....	76, 480
Decrease in 1902.....	10, 691

*Principal articles of export.*—Brick, coal, and general merchandise.

*Principal articles of import.*—Coal, tan bark, wood, sawlogs, and general merchandise.



is taken

6.3	8.2	6.8
8.5		
10.7	10.9	14.6
10.3	10.3	14.7
7.3	14.3	14.5
6.6	14.3	14.6
5.0	15.1	15.0
5.3	13.5	14.3
3.8	4.6	5.3

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## L L 12.

## IMPROVEMENT OF HARBOR AT MILWAUKEE, WISCONSIN, INCLUDING HARBOR OF REFUGE.

The natural condition of this work and projects for its improvement are described, and references for more extended information and for reports on examinations and surveys are given in the Annual Report of the Chief of Engineers for 1902, pages 446 and 2067.

*Operations during the fiscal year.*—Under the existing contract for building 2,450 linear feet of concrete superstructure on the breakwater and 1,050 linear feet of the same on north harbor pier, together with reenforcing the latter with pile protection, work on the breakwater was begun April 20 and continued since then. About 300 linear feet of the timber superstructure is removed and cribs leveled preparatory to placing the footing blocks and concrete, 162 footing blocks are molded and 53 of the same set in place, but no section of the work is entirely complete.

By hire of labor and the use of U. S. dredge No. 1, 1,621 cubic yards of material were removed from the channel.

To comply with the provisions of an item in act of June 13, 1902, a preliminary examination of the Milwaukee, Menominee, and Kinnickinnic rivers in the city of Milwaukee was made and report submitted July 19, 1902. Also a survey of these rivers was made and maps of the same are in course of preparation. A report of this survey, with maps, plans, and estimates, will probably be submitted by September 1, 1903.

*Condition of the improvement.*—The harbor channel has the required depth of 21 feet below datum for a minimum width of 140 feet.

Portions of the timber superstructure on the breakwater and on the north harbor pier not under contract for renewal are so weakened by decay that provision should be made for their renewal, as indicated under the heading of "Remarks and recommendations" in this report. See also accompanying map.

*Proposed operations.*—It is proposed to expend available balances and additional appropriation recommended:

First. In completing 2,450 feet of the breakwater superstructure, and 1,050 feet of north-harbor pier superstructure under contract now in force.

Second. In closing the 400-foot opening in the breakwater with timber-crib substructure, and in building concrete superstructure over it, and 1,800 linear feet adjacent thereto, the timber superstructure of this portion being greatly weakened by decay. Also providing the remaining 600 feet of the north-harbor pier with concrete superstructure, the present timber superstructure being very much decayed.

*Remarks and recommendations.*—In furtherance of the existing project for maintenance, upon the completion of operations under the contract now in force the opening in the breakwater should be closed, for reasons fully set forth in a report submitted by me, dated July 14, 1899; also in Annual Report for 1901, page 2937, to which attention is invited. And the remaining 1,000 feet of the shore arm, and 800 feet of the westerly end of the main arm of the breakwater should be provided with concrete superstructure, as the timber superstructures over

## 1858 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

these sections are in an unsafe condition by reason of decay. Also, for the same reason the remaining 600 feet of the north-harbor pier should be provided with concrete superstructure.

For the aforesaid purposes the following estimate for the fiscal year ending June 30, 1905, is urgently recommended:

*Estimate.*

<b>Breakwater:</b>	
For 400 feet timber crib substructure, at \$100 per foot.....	\$40,000
For 2,200 feet concrete superstructure, at \$54 per foot.....	118,800
<b>Harbor:</b>	
For 600 feet concrete superstructure, at \$54 per foot.....	32,400
Contingencies.....	18,800
<b>Total</b> .....	<b>210,000</b>

*Money statement.*

July 1, 1902, balance unexpended.....	\$255,907.72
June 30, 1903, amount expended during fiscal year.....	5,479.29
July 1, 1903, balance unexpended.....	250,428.43
July 1, 1903, amount covered by uncompleted contracts.....	215,000.00
{ Amount that can be profitably expended in fiscal year ending June 30, 1905, for maintenance of improvement, in addition to the balance unexpended July 1, 1903.....	
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	
	210,000.00

## APPROPRIATIONS.

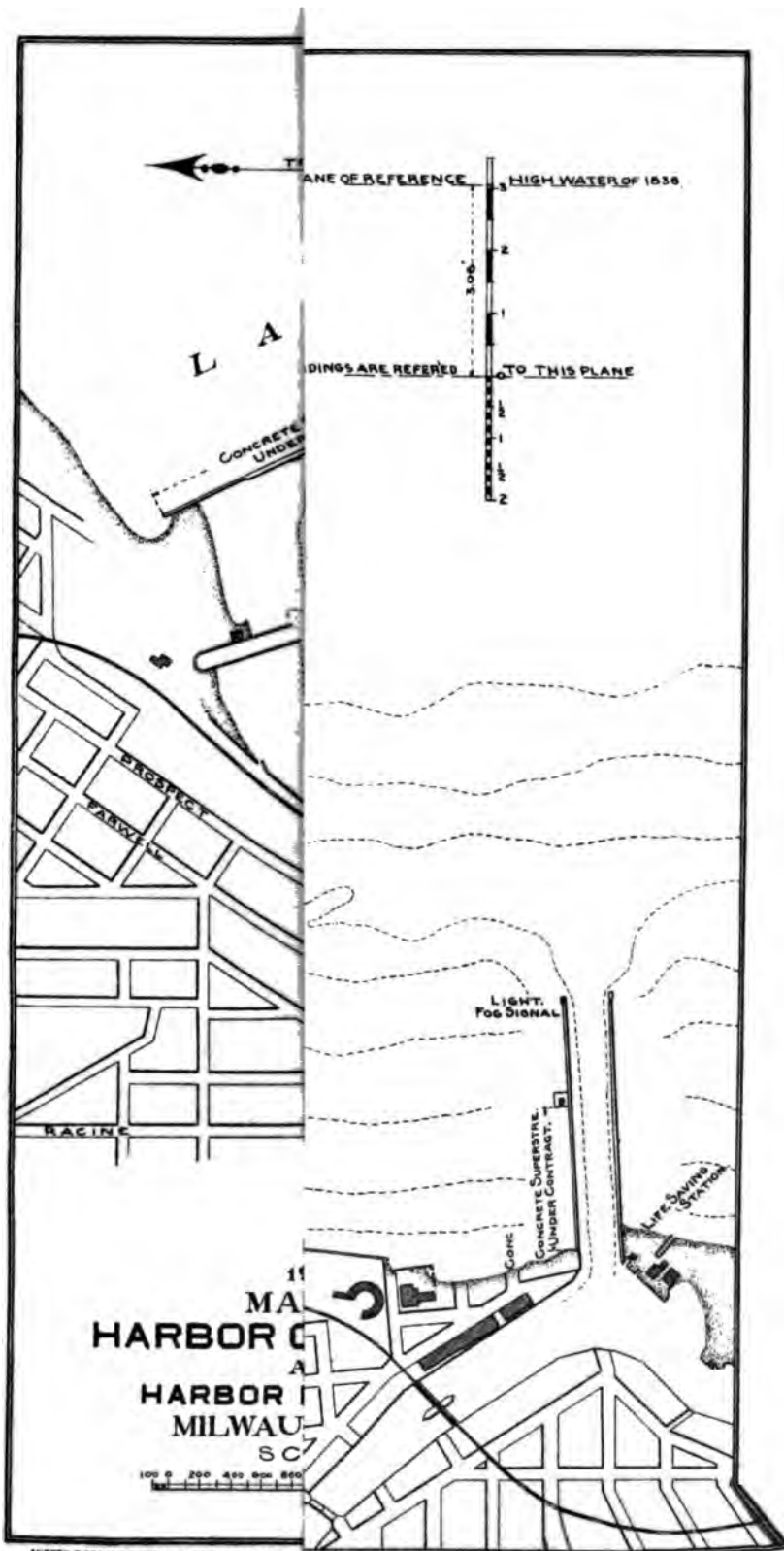
## HARBOR.

*Expended on former mouth of Milwaukee River.*

<b>Act of—</b>	
July 4, 1836.....	\$400.00
March 3, 1843.....	30,000.00
June 11, 1844.....	20,000.00

*Straight cut.*

<b>Act of—</b>	
August 30, 1852.....	\$15,000.00
March 3, 1853.....	163.94
June 23, 1866.....	48,283.51
April 10, 1869 (allotted).....	35,640.00
July 11, 1870.....	40,000.00
March 3, 1871.....	38,000.00
March 3, 1873.....	10,000.00
June 23, 1874.....	10,000.00
March 3, 1875.....	25,000.00
August 14, 1876.....	26,000.00
June 18, 1878.....	15,000.00
March 3, 1879.....	7,500.00
June 14, 1880.....	10,000.00
March 3, 1881.....	8,000.00
August 2, 1882.....	10,000.00
August 5, 1886 (from appropriation for harbor of refuge).....	4,737.91
August 11, 1888.....	10,000.00
March 17, 1890 (special act).....	6,100.00
September 19, 1890.....	6,000.00
July 13, 1892.....	14,000.00
August 18, 1894.....	7,000.00





Act of—	
June 3, 1896 .....	\$7,000.00
March 3, 1899 .....	26,000.00
Total expended at old river mouth and straight cut .....	429,825.36
Expended at former mouth of Milwaukee River .....	50,400.00
Total appropriated for straight cut (present harbor) .....	379,425.36

## HARBOR OF REFUGE.

Act of—	
March 3, 1881 .....	\$100,000.00
August 2, 1882 .....	100,000.00
July 5, 1884 .....	85,000.00
August 5, 1886 .....	\$60,000.00
From which allotted to Milwaukee Harbor .....	4,737.91
August 11, 1888 .....	55,262.09
September 19, 1890 .....	70,000.00
July 13, 1892 .....	80,000.00
August 18, 1894 .....	75,000.00
June 3, 1896 .....	45,000.00
June 4, 1897 .....	20,000.00
March 3, 1899 .....	168,737.91
June 6, 1900 .....	50,000.00
Miscellaneous receipts credited to appropriations .....	105,650.00
	1,149.31
Total .....	955,799.31
June 13, 1902 (harbor and harbor of refuge) .....	232,500.00
Aggregate .....	1,618,124.67

## CONTRACT IN FORCE.

For construction of 2,450 feet of concrete superstructure on breakwater, and 1,050 feet of concrete superstructure on north harbor pier, material to be paid for at the following rates:

Breakwater: Removing old superstructure and leveling cribs, at \$7 per linear foot; Norway pine timber, at \$40 per thousand feet B. M.; wrought iron bolts and spikes, at 5 cents per pound; concrete blocks, at \$9.25 per cubic yard; concrete in place, at \$8.50 per cubic yard; stone, at \$1.35 per ton.

North harbor pier: Removing old superstructure and leveling cribs, at \$7 per linear foot; Norway pine timber, at \$40 per thousand feet B. M.; white oak timber, at \$60 per thousand feet B. M.; Norway pine sheet piles, at \$40 per thousand feet B. M.; round piles, at 35 cents per linear foot; wire spikes, at 4 cents per pound; wrought-iron drift bolts and spikes, at 5 cents per pound; wrought-iron screw bolts and tie-rods, at 5 cents per pound; broken stone and gravel, at \$1.75 per cubic yard; concrete blocks, at \$9.25 per cubic yard; concrete in place, at \$8.50 per cubic yard.

Name of contractor: William H. Gillen.

Date of contract: January 3, 1903.

Date of approval: January 15, 1903.

Date of commencement: February 18, 1903.

Date for completion: December 31, 1904.

## COMMERCIAL STATISTICS FOR THE CALENDAR YEAR ENDING DECEMBER 31, 1902.

[Furnished by Mr. W. J. Langson, secretary chamber of commerce, Milwaukee, Wis.]

*Arrivals and departures of vessels.*

Description.	Arrivals.	Departures.
Steam .....	4,779	4,812
Sail .....	752	784
Total .....	5,531	5,596

# 1860 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

*By way of the harbor.*

	Tons.
Exports .....	1, 014, 965
Imports .....	2, 579, 157
Total .....	3, 594, 122
Tonnage in calendar year ending December 31, 1901 .....	4, 037, 597
Decrease in 1902 .....	443, 475

*Principal articles of export.*—Iron and steel, lumber, wool, provisions, grain, flour, machinery, malt, and beer.

*Principal articles of import.*—Coal, lumber, iron ore, salt, hides, tan bark, and general merchandise.

## L L 13.

### IMPROVEMENT OF SOUTH MILWAUKEE HARBOR, WISCONSIN.

See Annual Report of the Chief of Engineers for 1900, page 3701.

There were no operations since then other than the regular supervision. The act of June 13, 1902, provided for a—

Resurvey with a view to the modification of the present plan of said harbor, and with a view to ascertaining the feasibility and advisability of a harbor suitable for the needs of commerce at said port.

To comply with letter of instructions dated Office of the Chief of Engineers, June 23, 1902, this survey was made and report with plans, map, and estimate of cost submitted April 10, 1903, to which attention is invited.

#### *Money statement.*

July 1, 1902, balance unexpended .....	\$207. 16
June 30, 1903, amount expended during fiscal year .....	195. 06
July 1, 1903, balance unexpended .....	12. 10
Amount (estimated) required for completion of existing project .....	133, 000. 00

#### APPROPRIATION.

Act of June 3, 1896 .....	\$5, 000. 00
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#### COMMERCIAL STATISTICS FOR THE CALENDAR YEAR ENDING DECEMBER 31, 1902.

[Furnished by Mr. C. Franke, mayor, and Mr. Byron E. Walter, president Advancement Association, South Milwaukee, Wis.]

The harbor is not available; therefore there are no imports or exports by water.

*By railroad.*

	Tons.
Exports .....	120, 000
Imports .....	90, 000
Total .....	210, 000

The principal articles of manufacture are: Steam shovels and dredges, merchant bar iron, horse shoes, baskets, sash, doors and blinds, glue, whisky, office furniture, gray iron, malleable castings, merchant hardware, packing boxes, and fire engines.



## L L 14.

## IMPROVEMENT OF RACINE HARBOR, WISCONSIN.

The original condition of this harbor and projects for its improvement are described, and references for more extended information and for reports on examinations and surveys are given in Annual Report of the Chief of Engineers for 1903, page 486. See also accompanying map.

*Operations during the fiscal year.*—By hire of labor and the use of U. S. dredge No. 1, 2,608 cubic yards of material were removed from the channel. Minor repairs were made to the harbor piers and to the protection piling.

Plans and specifications were prepared for taking up and resetting one or two of the breakwater cribs on rectified line in accordance with the approved project.

*Condition of the improvement.*—Soundings taken June 9, 1903, indicate that the required depth of 21 feet below datum in the channel has decreased about 2 feet at the harbor entrance, the depth on the date specified being about 19 feet. About 750 feet of the south pier and 350 feet of the north pier require repairs. The remainder of the piers and the breakwater are in good condition.

*Proposed operations.*—It is proposed to apply available balance and additional appropriation recommended in taking up and resetting one or two cribs of the breakwater in accordance with the approved project. Proposals for this work will be opened August 4, 1903, in dredging for the restoration of the channel and to make necessary repairs to the piers.

*Remarks and recommendations.*—About 350 feet of the north pier and 750 feet of the south pier were constructed with cribs only 32 feet long and sunk on the natural lake bottom; consequently they settled very unevenly and left large openings in the piers, through which sand passed freely into the channel, causing an undue amount of dredging to be done in order to maintain the required depth therein. Previous attempts to render them impervious to the passage of sand have not been satisfactory. The superstructure is now in such an advanced stage of decay that its renewal is necessary.

It is considered inadvisable to rebuild superstructure on such defective substructure, and it is believed that it would be far better and more economical to remove these cribs and to substitute a pile pier similar to that built at Sheboygan in 1895, it having proved to be entirely satisfactory, and an estimate for that purpose is submitted.

*Estimate for maintenance of existing works for the fiscal year ending June 30, 1905.*

For dredging 30,000 cubic yards, at 15 cents .....	\$4, 500
For removing 1,100 feet of old crib pier and building pile pier in place thereof, at \$40 per foot .....	44, 000
For minor repairs to piers and breakwater .....	2, 500
For contingencies .....	5, 000
Total .....	<u>\$56, 000</u>

# 1862 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

## Money statement.

July 1, 1902, balance unexpended .....	\$21,470.94
Miscellaneous receipts .....	292.24
	<hr/> 21,763.18
June 30, 1903, amount expended during fiscal year .....	1,591.64
	<hr/> 20,171.54
{ Amount that can be profitably expended in fiscal year ending June 30, 1905, for maintenance of improvement, in addition to the balance unexpended July 1, 1903.....	56,000.00
{ Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

## APPROPRIATIONS.

Act of—		Act of—	
June 15, 1844.....	\$12,500.00	August 2, 1882.....	\$7,000.00
August 30, 1852.....	10,000.00	July 5, 1884.....	7,000.00
June 28, 1864.....	3,600.00	August 5, 1886.....	10,000.00
June 23, 1866.....	23,910.00	August 11, 1888.....	10,000.00
March 2, 1867.....	45,000.00	September 19, 1890.....	17,500.00
April 10, 1869 (allotted).....	22,275.00	July 13, 1892.....	25,000.00
July 11, 1870.....	10,000.00	August 18, 1894.....	20,000.00
March 3, 1871.....	10,000.00	June 3, 1896.....	27,000.00
March 3, 1873.....	20,000.00	March 3, 1899.....	50,000.00
June 23, 1874.....	10,000.00	June 6, 1900.....	67,650.00
March 3, 1875.....	10,000.00	June 13, 1902.....	20,000.00
August 14, 1876.....	8,000.00	Miscellaneous receipts credited to appropriations.....	364.80
June 18, 1878.....	10,000.00		
March 3, 1879.....	6,000.00		
June 14, 1880.....	6,000.00		
March 3, 1881.....	6,000.00	Total .....	474,799.80

## COMMERCIAL STATISTICS FOR THE CALENDAR YEAR ENDING DECEMBER 31, 1902.

[Furnished by Mr. Peter B. Nelson, mayor.]

### Arrivals and departures.

Description.	Arrivals.	Departures.
Steam.....	1,555	1,555
Sail.....	129	132
Total.....	1,684	1,687

### By way of the harbor.

	Tons.
Exports .....	126,720
Imports .....	427,656
Total .....	554,376
Tonnage in calendar year ending December 31, 1901 .....	516,531
Increase in 1902 .....	37,845

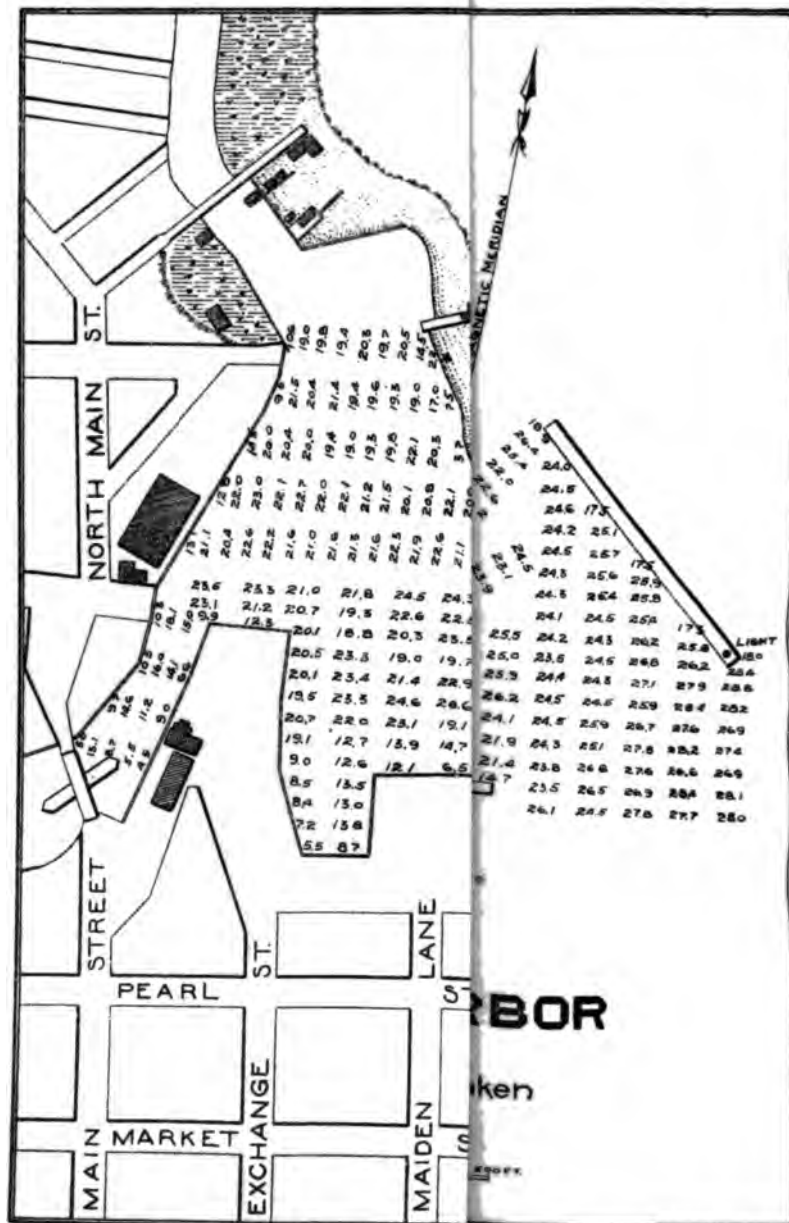
*Principal articles of export.*—Stone, mill stuffs, flour, and general merchandise.

*Principal articles of import.*—Furniture, coal, lumber, stone, wood, and general merchandise.









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## L L 15.

## IMPROVEMENT OF KENOSHA HARBOR, WISCONSIN.

The original condition of this harbor and projects for its improvement are described and references for more extended information and maps and for reports on examinations and surveys are given in Annual Report of the Chief of Engineers for 1903, page 487.

*Operations during the fiscal year.*—There were no operations other than taking soundings and preparation of maps incident to care and supervision.

*Condition of the improvement.*—Slight shoaling has occurred in places in the 21-foot channel and in the 20-foot basin, but not to an extent to require immediate dredging. The piers and breakwater are in good condition.

*Proposed operations.*—It is proposed to apply available balances and appropriation recommended in taking up and resetting one or two of the breakwater cribs in accordance with the approved project, to do such dredging as may be necessary to restore the required depth in channel and basin, and to make such minor repairs as may be needed to the piers and to the breakwater.

*Estimate for fiscal year ending June 30, 1905, for maintenance of existing works.*

For dredging 30,000 cubic yards, at 15 cents .....	\$4, 500
For minor repairs to piers and breakwater .....	2, 500
Contingencies, 10 per cent .....	700
<b>Total .....</b>	<b>7, 700</b>

*Money statement.*

July 1, 1902, balance unexpended .....	\$18, 031. 49
June 30, 1903, amount expended during fiscal year .....	247. 46
July 1, 1903, balance unexpended .....	17, 784. 03
<hr/>	
{ Amount that can be profitably expended in fiscal year ending June 30, 1905, for maintenance of improvement, in addition to the balance unexpended July 1, 1903 .....	7, 700. 00
{ Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

## APPROPRIATIONS.

Act of—		Act of—	
March 15, 1844 .....	\$12, 500. 00	August 2, 1882 .....	\$6, 000. 00
March 3, 1845 .....	15, 000. 00	July 5, 1884 .....	5, 000. 00
August 13, 1852 .....	10, 000. 00	August 5, 1886 .....	5, 000. 00
June 23, 1866 .....	75, 461. 41	August 11, 1888 .....	7, 500. 00
April 10, 1869 (allotted) ..	5, 346. 00	September 19, 1890 .....	17, 500. 00
July 11, 1870 .....	10, 000. 00	July 13, 1892 .....	15, 000. 00
March 3, 1871 .....	10, 000. 00	August 18, 1894 .....	15, 000. 00
June 10, 1872 .....	10, 000. 00	June 3, 1896 .....	24, 000. 00
June 23, 1874 .....	10, 000. 00	March 3, 1899 .....	50, 000. 00
March 3, 1875 .....	15, 000. 00	June 6, 1900 .....	135, 000. 00
August 14, 1876 .....	8, 000. 00	June 13, 1902 .....	5, 000. 00
June 18, 1878 .....	8, 000. 00	Miscellaneous receipts credited to appropriation .....	157. 71
March 3, 1879 .....	5, 000. 00		
June 14, 1880 .....	5, 000. 00		
March 3, 1881 .....	5, 000. 00	<b>Total .....</b>	<b>489, 465. 12</b>

# 1864 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

COMMERCIAL STATISTICS FOR THE CALENDAR YEAR ENDING DECEMBER 31, 1902.

[Furnished by Mr. H. S. Van Ingen.]

## Arrivals and departures of vessels.

Description.	Arrivals.	Departures.
Steam.....	98	97
Sail.....	68	69
Total.....	166	166

## By way of the harbor.

Tonnage in calendar year ending December 31, 1901 ..... 134, 678

*Principal articles of export.*—Furniture, coal, and general merchandise.

*Principal articles of import.*—Lumber, coal, tan bark, general merchandise.

**NOTE.**—Mr. Van Ingen states that it is impracticable to obtain a detailed statement of statistics, but they would not materially differ from those reported for last year.

## L L 16.

### IMPROVEMENT OF WAUKEGAN HARBOR, ILLINOIS.

The original condition of this harbor and projects for its improvement are described, and references for more extended information, and for report on examinations and surveys are given in Annual Report of the Chief of Engineers for 1903, page 488.

*Operations during the fiscal year.*—By hire of labor and the use of U. S. dredge No. 1, 7,056 cubic yards of material were removed from the channel and basin, also a large bowlder in the basin that was a serious menace to navigation was removed by the dredge.

Under the existing contract for dredging, building pile pier, and removing old pier, dredging was begun April 27, and temporarily suspended June 10. During this period 19,666 cubic yards of material were removed from the channel and basin.

Under the contract in force for pier extension and building breakwater a large quantity of materials were delivered and preliminary arrangements nearly completed for beginning crib building early in July.

*Condition of the improvement.*—Outside of the pierheads the channel has a depth of 20 feet below datum for a minimum width of 60 feet, and the same width, 18 feet below datum between the piers and in the basin.

About 600 feet of the north pier, and 740 feet of the south pier require renewal above the water line.

*Proposed operations.*—It is proposed to apply available balances and additional appropriation recommended in completing the 20-foot channel by pier extension and dredging, building the breakwater, and taking up a section of the north pier and building pile revetment on rectified line under contracts now in force.

Also to make needed repairs to the piers, and maintain the required depth in the channel and basin.



An estimate for maintenance for the fiscal year ending June 30, 1905, as follows, is submitted:

For repairs to 600 feet of the north pier, at \$12.50 per foot .....	\$7, 500
For dredging 30,000 cubic yards, at 15 cents per yard .....	4, 500
Contingencies, 10 per cent .....	1, 200
Total .....	13, 200

*Money statement.*

July 1, 1902, balance unexpended .....	\$101,555. 59
Amount appropriated by sundry civil act of March 3, 1903 .....	240, 000. 00
	<hr/>
June 30, 1903, amount expended during fiscal year .....	341,555. 59
	5, 473. 13
July 1, 1903, balance unexpended .....	<hr/>
	336, 082. 46
July 1, 1903, amount covered by uncompleted contracts .....	<hr/>
	302, 743. 19
	<hr/>
{ Amount (estimated) required for completion of existing project .....	5, 000. 00
{ Amount that can be profitably expended in fiscal year ending June 30, 1905, in addition to the balance unexpended July 1, 1903:	
For works of improvement .....	\$5, 000. 00
For maintenance of improvement .....	13, 200. 00
	<hr/>
	18, 200. 00
{ Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

APPROPRIATIONS.

Act of—	
August 30, 1852, for breakwater (outer) .....	\$15, 000
June 14, 1880 .....	15, 000
March 3, 1881 .....	15, 000
August 2, 1882 .....	20, 000
July 5, 1884 .....	20, 000
August 15, 1886 .....	20, 000
August 11, 1888 .....	25, 000
September 19, 1890 .....	35, 000
July 13, 1892 .....	25, 000
August 18, 1894 .....	20, 000
June 3, 1896 .....	20, 000
March 3, 1899 .....	5, 500
June 13, 1902 .....	100, 000
March 3, 1903 .....	240, 000
	<hr/>
Total appropriation for harbor .....	575, 500
Appropriation for outer breakwater (1852) .....	15, 000
	<hr/>
Total for present harbor .....	560, 500

CONTRACTS IN FORCE.

For construction of 1,000 feet of north pier extension, 1,400 feet south pier extension, and 588 feet of breakwater, material to be paid for at the following rates: Foundation and protection piles at \$9 each; white oak foundation piles at \$12 each; stone at 96 cents per ton; Douglas or Oregon fir and longleaf yellow or southern pine timber at \$32 per 1,000 feet B. M.; hemlock timber at \$25.75 per 1,000 feet B. M.; pine plank at \$32 per 1,000 feet B. M.; hemlock plank at \$25 per 1,000 feet B. M.; wrought-iron drift bolts at 3½ cents per pound; wrought-iron screw bolts at 3½ cents per pound; wrought-iron and wire spikes at 3½ cents per pound.

## 1866 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

Name of contractor: Hausler & Lutz Towing and Dock Company

Date of contract: March 30, 1903.

Date of approval: April 25, 1903.

Date of commencement: May 26, 1903.

Date for completion: December 31, 1904.

For construction of 770 feet of pile revetment, removing 935 feet of old pier, dredging 337,000 cubic yards of sand, mud, etc., and 25,000 cubic yards of hardpan and bowlders, the material to be paid for at the following rates: Norway pine, tamarack, or rock elm piles at 30 cents per linear foot; white oak piles at 37 cents per linear foot; Wakefield sheet piling of Norway pine plank at \$50 per 1,000 feet B. M.; white pine timber and plank at \$46.50 per 1,000 feet B. M.; wrought-iron drift bolts at 4 cents per pound; wrought-iron screw bolts and tie-rods at 4 cents per pound; wrought-iron and wire spikes at 3½ cents per pound; tearing out and removing a portion of old pier for \$8,000; dredging sand, mud, etc., at 9 cents per cubic yard, and dredging hardpan and bowlders at 25 cents per cubic yard.

Name of contractor: The Lydon & Drews Company.

Date of contract: March 30, 1903.

Date of approval: April 27, 1903.

Date of commencement: April 30, 1903.

Date for completion: December 31, 1904.

### COMMERCIAL STATISTICS FOR THE CALENDAR YEAR ENDING DECEMBER 31, 1902.

[Furnished by Mr. W. W. Pearce, mayor of Waukegan, Ill.]

#### *Arrivals and departures of vessels.*

Description.	Arrivals.	Departures.
Steam.....	442	440
Sail.....	14	14
Total.....	456	454

#### *By way of the harbor.*

	Tons.
Exports.....	598
Imports.....	35,097
Total.....	35,695
Tonnage in calendar year ending December 31, 1901.....	110,429
Decrease in 1902.....	74,734

*Principal articles of export.*—Mill stuffs, manufactured brass, and iron and steel.

*Principal articles of imports.*—Coal, lumber, railroad ties, and general merchandise.

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### IMPROVEMENT OF FOX RIVER, WISCONSIN.

The original condition, object of the improvement, projects, etc., are fully described in Annual Report of the Chief of Engineers for 1898, page 2339.

During the past year the water in the lower Fox and Lake Winnebago has been maintained at the crest of the dams throughout the season of navigation. This favorable condition has now prevailed for seven consecutive seasons, due to the enforcement of rule 12, Rules

and Regulations for the Navigation and Use of Locks and Canals on Fox River. No serious violations of these rules occurred during the year, and no arrests were necessary. Apparently all parties along the river recognize the value of these rules, when impartially enforced, in protecting the rights of each and promoting the best interests of all.

Attention is invited to the report upon "Operating and care of locks and dams on Fox River, Wisconsin."

During the fiscal year ending June 30, 1903, navigation closed November 26, 1902, and reopened April 10, 1903.

*Operations during the fiscal year.*—The operations during the year consisted in improving Miller Bay, Lake Winnebago, dredging channel upper Fox River, repairing dredging plant, and necessary office work and superintendence.

For details see accompanying report of Mr. L. M. Mann, assistant engineer.

*Remarks.*—The approved project provides for widening and deepening the channel of the Fox River from Green Bay to Montello, 100 feet wide and 6 feet deep, and from Montello to Portage, 100 feet wide and 4 feet deep at mean low water.

During the fiscal year ending June 30, 1904, work will be continued in improving Wolf River, Miller Bay, Stockbridge and Calumet harbors, in widening and deepening the channel of Fox River by dredging, and the purchase of a suitable dredge, as provided for in river and harbor act of June 13, 1902.

For carrying out the approved project for widening and deepening the channel of Fox River by dredging it is recommended that \$100,000 be appropriated for the fiscal year ending June 30, 1905.

#### *Money statement.*

July 1, 1902, balance unexpended .....	\$76, 685. 99
Miscellaneous receipts .....	453. 09
	<hr/>
June 30, 1903, amount expended during fiscal year .....	77, 139. 08
	3, 433. 64
	<hr/>
July 1, 1903, balance unexpended .....	73, 705. 44
July 1, 1903, outstanding liabilities .....	1, 100. 02
	<hr/>
July 1, 1903, balance available .....	72, 605. 42
	<hr/>
{ Amount (estimated) required for completion of existing project .....	145, 866. 48
{ Amount that can be profitably expended in fiscal year ending June 30,	
{ 1905, in addition to the balance unexpended July 1, 1903 .....	100, 000. 00
{ Submitted in compliance with requirements of sundry civil act of June	
{ 4, 1897.	

#### APPROPRIATIONS.

Act of—	
March 2, 1867, for snag boat on Wisconsin River .....	\$40, 000. 00
July 10, 1870, for improving Wisconsin River .....	100, 000. 00
June 10, 1872, for purchase of works on Fox River from Green Bay	
and Mississippi Canal Company .....	145, 000. 00
March 3, 1873, for improving Fox and Wisconsin rivers .....	300, 000. 00
June 23, 1874 .....	300, 000. 00
March 3, 1875 .....	500, 000. 00
August 14, 1876 .....	270, 000. 00
June 18, 1878 .....	250, 000. 00

# 1868 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

Act of—

March 3, 1879.....	\$150,000.00
June 14, 1880.....	125,000.00
March 3, 1881.....	125,000.00
August 2, 1882.....	200,000.00
July 5, 1884.....	160,000.00
August 5, 1886, for improving Fox River.....	56,250.00
August 11, 1888, for improving Fox River.....	100,000.00
September 19, 1890, for improving Fox River.....	100,000.00
July 13, 1892, for improving Fox River.....	75,000.00
August 18, 1894, for improving Fox River.....	37,500.00
June 3, 1896, for improving Fox River.....	37,500.00
March 3, 1899, for improving Fox River.....	27,500.00
June 13, 1902.....	70,000.00
Miscellaneous receipts credited to appropriations.....	1,473.09
<b>Total.....</b>	<b>3,170,223.09</b>

## COMMERCIAL STATISTICS.

*List of articles transported on Fox River, Wisconsin, during the season of 1902.*

Articles.	Quantity.	Articles.	Quantity.
	<i>Tons.</i>		<i>Tons.</i>
Beer.....	106.25	Logs.....	136,770
Brick.....	13,327.50	Lumber.....	7,704.75
Cedar posts.....	105	Oil.....	32
Cement.....	15	Paper.....	169.50
Clay.....	5,232	Pig iron.....	78
Coal.....	17,393	Piles.....	24
Cord wood.....	14,000	Pulp wood.....	30,930
Flour, grain, and mill stuffs.....	2,143.50	Rags and chemicals.....	514
Gravel.....	2,700	Salt.....	763.25
General merchandise.....	4,024	Sand.....	24,747
Hay.....	592	Shingles.....	707.50
Iron.....	200	Stone.....	2,502.50
Land plaster.....	35	Sugar.....	38.50
Lath.....	40.25		
Lime.....	394	<b>Total.....</b>	<b>265,297.75</b>
Live stock.....	9.25		

Passengers, 57,399.

*List of boats navigating Fox River between Portage and Green Bay, Wis., 1902.*

Name of boat.	Draft.	Ton-nage.	Class.	Name of boat.	Draft.	Ton-nage.	Class.
	<i>Feet.</i>				<i>Feet.</i>		
Thistle.....	2½	127	Steam.	Georgia.....	5½	78	Sailing scow.
Le Fevre.....	2½	133	Do.	Glen Cuyler.....	6	46	Do.
Fashion.....	3	94	Do.	Sandy.....	4	125	Tow barge.
B. F. Carter.....	4	110	Do.	Long Tom.....	5½	210	Do.
J. H. Marston.....	4½	150	Do.	Bray.....	5½	210	Do.
J. E. Leimer.....	4	110	Do.	Pelton.....	6	200	Do.
Evelyn.....	2½	150	Do.	Taylor.....	6	200	Do.
John Denessen.....	6	15	Steam tug.	Anna M.....	2½	90	Steam yacht.
Nettle Denessen.....	6	23	Do.	Okoboji.....	4½	10.99	Do.
H. O. Warren.....	4	26	Do.	Cambria.....	4		Do.
M. D. Moore.....	3	36	Do.	Irma.....	3½		Do.
S. W. Hollister.....	3	32	Do.	Nia.....	3½		Do.
Boscobel.....			Do.	Swallow.....	3½		Do.
D. A. Cady.....	3	50	Do.	Queen of the Lake.....	3½		Do.
Volunteer.....	6	17	Do.	May Flower.....	3		Do.
Mac Martell.....	6	38	Do.				

NOTE.—There are also a number of small pleasure craft, both steam and gasoline, besides those mentioned.

*Number of lockages on Fox River, Wisconsin, for the calendar year 1902.*

No.	Lock.	Lock-ages.	No.	Lock.	Lock-ages.
1	Depere .....	535	16	Appleton second .....	200
2	Little Kaukauna .....	462	17	Appleton first .....	396
3	Rapide Croche .....	446	18	Menasha .....	510
4	Kaukauna fifth .....	439	19	Eureka .....	427
5	Kaukauna fourth .....	441	20	Berlin .....	345
6	Kaukauna third .....	441	21	White River .....	209
7	Kaukauna second .....	451	22	Princeton .....	221
8	Kaukauna first .....	487	23	Grand River .....	240
9	Little Chute fourth <sup>a</sup> .....	456	24	Montello .....	141
10	Little Chute third .....	456	25	Governor Bend .....	149
11	Little Chute second .....	413	26	Fort Winnebago .....	206
12	Little Chute first .....	413	27	Portage .....	91
13	Cedars .....	280			
14	Appleton fourth .....	293		Total .....	9,848
15	Appleton third .....	200			

<sup>a</sup> Combined.

#### REPORT OF MR. L. M. MANN, ASSISTANT ENGINEER.

UNITED STATES ENGINEER OFFICE,  
FOX RIVER IMPROVEMENT,  
Oshkosh, Wis., June 30, 1903.

MAJOR: I have the honor to submit the following report of operations on "Improving Fox River, Wisconsin," from Portage to Green Bay for the fiscal year ending June 30, 1903:

The work done during the year consisted in improving Miller Bay, Lake Winnebago, dredging channel upper Fox River, and repairing side-dump scows Nos. 1 and 2.

#### IMPROVING MILLER BAY.

The work of building a breakwater in Miller Bay, Lake Winnebago, and in dredging a basin inside of same was commenced on May 16 by dredge No. 4, and has been prosecuted continuously since, with the assistance of steam tugs *Wolf* and *Fox*.

The line of the breakwater was established, and material was dredged from the basin and thrown up to form the breakwater. Material was also dredged from the basin and dumped on the north side of Horseshoe Island outside the basin. The breakwater was riprapped with stone along the inner end and the outer side. About half of the breakwater embankment is completed and the balance is about two-thirds completed.

The work performed by the dredge is shown in the accompanying tabulation.

#### DREDGING UPPER FOX RIVER.

Dredging was carried on for providing a navigable channel 100 feet wide and 6 feet deep at mean low water. Upon the suspension of the work, in August, 1900, the channel had been completed to a point 300 feet above milepost No. 42, with the exception of three-fourths of a mile between mileposts Nos. 34 and 35. Work at this place was resumed by dredge No. 4 on October 4 and by dredge No. 5 on October 11, 1902.

On October 20 dredge No. 4 was withdrawn and the channel at this place was completed by dredge No. 5 December 5, after which she was laid up for the winter. On May 13, 1903, work was resumed by dredge No. 5 immediately below Princeton Lock and has been prosecuted continuously since.

The channel, 6 feet deep at mean low water, is now completed in accordance with the project from Green Bay to White River Lock, and is 3½ feet deep from White River Lock to Portage, the head of navigation on the Fox River.

The channel, 4½ feet deep at mean low water, is completed on the Wolf River to New London, above which place no work has been done.

A summary of the work done is shown in the accompanying tabulation.

#### REPAIRING SIDE-DUMP SCOWS NOS. 1 AND 2.

These scows were placed in dry dock at Kaukauna in April. Repairs were made to bulkheads, gunwales, stringers, floor timbers, hoppers, etc., and the seams were calked and pitched, and they were then towed to Miller Bay and used in the work there.

# 1870 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

## Tabulation of dredging.

Location.	Summary of cuts.			Material (dipper measurement).		Character of material dredged.	Number of dredge working.
	Length.	Average width.	Average depth.	Handled.	Re-handled.		
Between mileposts 34-35....	<i>Feet.</i> 5,150	<i>Feet.</i> 25-60	<i>Feet.</i> 4-5	<i>Cu. yds.</i> 20,254	<i>Cu. yds.</i> 920	Sand, clay, and stone.	4 and 5
Between mileposts 52-53....	425	50-70	1-5	1,880	400	Sand .....	5
Between mileposts 51-52....	5,410	40-60	1-7	35,146	2,120	.....do .....	5
Miller Bay improvement....	4,635	25-30	2-6	17,131	4,270	Clay and stone.	4
Total .....	15,620	.....	.....	74,411	7,710		

The total amount of dredging done during the fiscal year was 74,411 cubic yards, dipper measurement, at an expense of \$1,744.17, or at the rate of 2.34 cents per cubic yard.

Respectfully submitted.

L. M. MANN, *Assistant Engineer.*

Maj. JAMES G. WARREN,  
*Corps of Engineers.*

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## OPERATING AND CARE OF LOCKS AND DAMS ON FOX RIVER, WISCONSIN.

The work during the fiscal year consisted principally in dredging bars and channels in the river, making repairs to locks, dams, canal banks, lock houses, dredges, and boats; rebuilding gates and repairing floors of Grand River and White River locks, rebuilding gates at Princeton and Little Chute combined locks, rebuilding Kaukauna second lock with cut-stone masonry, building shore protections to sand banks on upper Fox River, and care of works and property.

For details of work done during the year see the report of Mr. L. M. Mann, assistant engineer, appended to this report.

It is again particularly to be noted that the continued enforcement of the rules and regulations for the navigation and use of the locks and canals on Fox River, approved by the Secretary of War, under the river and harbor act of August 18, 1894, amended by act of June 13, 1902, has brought about a general condition which is far more satisfactory than ever before to all interests concerned.

A revocable license dated July 10, 1899, was granted by the Secretary of War, permitting the Neenah and Menasha Water Power Company to place 8-inch flush boards on the Menasha dam on conditions previously agreed to by the company in writing. Flush boards were placed on the dam by the company July 1, 1902, were removed July 3, 1902, again placed July 6, 1902, and remained placed until February 5, 1903, when removed and not replaced to date.

An itemized statement of the expenditures during the year, required by section 4, river and harbor act of July 5, 1884, is appended hereto.

*Money statement.*

July 1, 1902, balance unexpended .....	\$22,200.00
Amount allotted for year ending June 30, 1903 .....	71,147.51
Miscellaneous receipts .....	99.68
	<hr/>
June 30, 1903, amount expended during fiscal year .....	93,447.19
	<hr/>
July 1, 1903, balance unexpended .....	24,964.60
July 1, 1903, outstanding liabilities .....	3,000.00
	<hr/>
July 1, 1903, balance available .....	21,964.60
Amount (estimated) for expenditure in fiscal year ending June 30, 1904 <sup>a</sup> ..	48,776.32
	<hr/>
Amount available for fiscal year ending June 30, 1904 .....	70,740.92

*List of allotments from appropriation for operating and care of canals and other works of navigation (indefinite), act of July 5, 1884, applied to Fox River, Wisconsin.*

August 9, 1884 .....	\$54,000.00	July 29, 1898 .....	\$63,869.10
July 28, 1885 .....	42,304.00	October 4, 1898 .....	3,000.00
July 20, 1886 .....	43,668.00	July 22, 1899 .....	72,911.29
July 13, 1887 .....	43,650.00	January 6, 1900 .....	2,000.00
June 28, 1888 .....	48,900.00	May 29, 1900 .....	6,362.54
June 12, 1889 .....	62,760.00	July 20, 1900 .....	78,167.11
November 25, 1889 .....	13,500.00	August 10, 1900 .....	6,238.40
June 19, 1890 .....	69,005.00	July 19, 1901 .....	54,563.57
April 28, 1891 .....	63,980.00	July 21, 1902 .....	68,397.51
July 1, 1892 .....	40,000.00	October 4, 1902 .....	2,750.00
July 15, 1893 .....	32,430.55	Miscellaneous receipts credited to appropriations ..	112.59
July 26, 1894 .....	30,882.37		
July 20, 1895 .....	61,279.63		
October 6, 1896 .....	62,665.03		
July 30, 1897 .....	60,009.62	Total .....	1,087,406.31

*Summary of expenditures made from appropriation for operating and care of canals and other works of navigation (indefinite), act of July 5, 1884, applied to Fox River, Wisconsin, during the fiscal year ending June 30, 1903.*

Services .....	\$41,108.80
Supplies .....	3,075.09
Materials .....	23,578.46
Miscellaneous .....	720.24
	<hr/>
Total .....	68,482.59

## REPORT OF MR. L. M. MANN, ASSISTANT ENGINEER.

UNITED STATES ENGINEER OFFICE,  
FOX RIVER IMPROVEMENT,  
Oshkosh, Wis., June 30, 1903.

MAJOR: I have the honor to submit the following report of operations upon "Operating and care of canals and other works of navigation on Fox River, Wisconsin" from Green Bay to Portage, for the fiscal year ending June 30, 1903.

The work done during the year consisted principally in rebuilding the gates and repairing the floors of Grand River and White River locks; rebuilding the gates of Princeton lock; providing Appleton first lock with steel gate spars and rebuilding

<sup>a</sup> Amount allotted if estimate is approved.

# 1872 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

crib above left head wall; rebuilding the middle and lower gates of Little Chute combined locks; entirely rebuilding Kaukauna second lock with cut stone masonry; making slight repairs to Montello, White River, Eureka, Menasha, Little Kaukauna, and Depere dams; Fort Winnebago, Governor Bend, Eureka, Menasha, Appleton fourth, Cedars, Little Chute second, Kaukauna fifth, and Rapide Croche locks; lock houses at Princeton, Eureka, Menasha, Appleton third and fourth, Cedars, and Kaukauna first locks; canal banks at Little Chute and Kaukauna; repairing channel cribs at Appleton and Little Chute; special and general repairs to boats and dredges; new boiler for steam tug *Fox*; new 50-foot scow; dredging bars and channels; general repairs to locks, dams, and canal banks, and care of works and property.

## MAINTENANCE OF NAVIGATION.

Navigation was formally closed on Fox and Wolf rivers November 26, 1902, and again opened April 10, 1903. Grand River lock was closed off for repairs from June 30 to July 17, 1902, White River lock from September 8 to September 18, 1902, Kaukauna second lock from April 10 to April 27, 1903.

The water in the lower Fox and Lake Winnebago has been well maintained at the crest of the dams throughout the year, and no arrests for infringement of rule 12 of the regulations, etc., were necessary.

The stage in Lake Winnebago for 1903 was below the crest of the Menasha dam on fifty-seven days; in 1902 it was below the crest one hundred and eighteen days; in 1901, fifty-five days, and in 1900, one hundred and ninety-seven days.

The Neenah and Menasha Water Power Company was given permission on November 28, 1902, to draw the water 18 inches below the crest during the close of navigation. The water was carefully used and the lowest point reached was only 7 inches below the crest, in February, and it again reached the crest March 18, 1903.

The stages in Lake Winnebago were as follows:

Water below crest of Menasha dam .....	days..	57
Water at or above crest of Menasha dam .....	do....	306
Maximum height in 1903, April 10 .....		+3.25
Maximum height in 1902, May 26 .....		+3.28
Maximum height in 1901, April 13 .....		+3.17
Maximum height in 1900, November 22 .....		+2.87
Maximum height in 1899, May 15 .....		+3.25
Lowest point reached, February 27, 1903 .....		+1.17
Mean high water for twenty-one years .....		+3.07

The maximum discharge of river during the year, measured at Rapide Croche dam, which gives practically the whole flow, was 511,026 cubic feet per minute, on April 15, 1903.

The mean monthly discharges at Rapide Croche dam, which correspond closely to the discharges at Neenah and Menasha combined, for the year are as follows:

	Cubic feet per minute.		Cubic feet per minute.
1902.		1903.	
July .....	258,227	January .....	165,633
August .....	173,778	February .....	176,967
September .....	76,276	March .....	229,622
October .....	111,027	April .....	390,031
November .....	143,614	May .....	326,140
December .....	136,418	June .....	303,668
		Mean for year .....	207,618

The largest previous discharge was 739,034 cubic feet per minute, on May 29, 1902, since measurements were had at this place.

Flushboards were placed on the Menasha dam by the Neenah and Menasha Water Power Company July 1, 1902, but were removed on the 3d and again placed on the 8th, and remained until February 5, 1903, when they were removed, and have not been replaced since. The mills were not obliged to close their wheels during the entire year, except for two days, March 19 and 20, when a break occurred in Appleton upper dam and the water was drawn down to make examination and repairs. The water in Lake Winnebago reached a stage requiring sluicing from April 2 to 7, from April 10 to 15, and from May 29 to June 2.



Gauge readings were calculated, tabulated, and platted, as were also the daily discharge of the river at different points, and record of rain gauges was kept.

#### REPAIRS OF LOCKS, ETC.

*Depere dam.*—The right abutment was reinforced with earth placed on left bank of canal, back of same, raising the bank about 1 foot above the top of the abutment. The retaining wall on left bank of canal above drawbridge was raised about 1 foot.

*Little Kaukauna dam.*—The crib below left abutment was removed and rebuilt above water surface; the masonry in left abutment was repaired and the joints pointed with Portland cement.

*Little Kaukauna dike.*—Two hundred and twenty-five linear feet of this dike, extending out from the shore end, was riprapped with 12 cords of stone.

*Rapide Croche lock.*—The walls of this lock were backed with 680 cubic yards of earth.

*Rapide Croche lock house.*—Plans and specifications were prepared for this lock house. No further work has been done.

*Kaukauna fifth lock.*—The joints in dry wall above lock on left side were pointed with Portland cement mortar. The old plank platform in front of lock house was removed, and the depression between lock and house was filled in with earth.

*Rebuilding Kaukauna second lock.*—This lock was originally built by the Fox and Wisconsin Improvement Company in 1854. It was rebuilt by the United States in 1889-90, and has since received minor repairs. It was composed of dry rubble masonry faced with a double sheathing of plank spiked to a framework of timber built into the wall and fastened thereto with iron tie rods.

The present repairs consist in entirely rebuilding the lock, making the following improvements:

The lock is lengthened upstream 9.6 feet, making the distance between hollow quoins 170 feet, the regulation length. The walls are built of cut-stone masonry with heavy rubble backing laid in Louisville cement upon a concrete leveling course laid on the limestone foundation.

Filling valves in lock gates are replaced by horizontal valves in raised platform. New solid timber gates with gas-pipe hand rails and wrought-steel emptying valves; new steel gate spars operated by the tripod system; new breast wall and upper wing walls of cement masonry; lower wing walls rebuilt with dry rubble masonry, except a part of the lower right wing wall, occupied by the Chicago and Northwestern Railway for the abutment to their drawbridge, which was rebuilt in cement masonry by the railway company; iron snubbing posts and walls well backed with earth.

*Construction.*—Work was commenced on November 26, 1902; stop timbers were placed at the end of the Kaukauna first lock, and the water was drawn off the canal. The work of construction was carried on in the same manner as the rebuilding of previous locks. A spur track was placed by the Chicago and Northwestern Railway Company upon a trestle built of the old lock timbers by the United States Government alongside their track on the right side of the lock, upon which the cars loaded with construction material were delivered.

A stiff-leg derrick operated with a hoisting engine was placed on the right bank midway between the side track and the lock wall. A tram trestle was erected from old timbers through the lock chamber. Stone received by cars was transferred to tram cars with the stiff-leg derrick and placed in position on the lock walls with four guy derricks erected on the center line of the lock. Rubblestone removed from the walls was crushed for use in the concrete leveling course.

*Masonry.*—Upon removing the timber and loose stone from the old walls it was found that the lock was situated upon bed rock, the upper courses of which had been removed to a depth of about 4 feet and a width of about 50 feet from a point immediately above the breast wall. The bed has considerable dip and the foundation was leveled up with concrete, composed of 1 part of Louisville cement to 1½ part sand and 2½ parts crushed stone, and varying in thickness from 3 to 28 inches.

This work was done in January, 1903, and on account of freezing weather favorable days were selected for doing the work. Before mixing, the stone, sand, and water were heated by steam. The material in proper proportions was placed on a platform on bank at side of lock from which it was shoveled into a gravity concrete mixer and, passing through the same, was received in wheelbarrows in which it was conveyed directly to its place. The time consumed for placing the concrete was about one day for each side of the lock. Immediately after being properly placed the concrete was covered with boards over which was spread a layer of about 6 inches of manure, which was allowed to remain from six to eight days. Upon removing the manure the concrete was found to be well set and in first-class condition.

tion, and frequent examinations during the time of setting disclosed the fact that the concrete had been entirely protected from frost, although the temperature had been as low as  $+3^{\circ}$  F.

The location of the new breast wall, being 10 feet above the old one, comes on the bed rock, which is 4 feet higher than the lock floor, and being in good condition was not removed.

The cut stone used was Duck Creek lime stone from the quarry of the Gillen Stone Company, of Velp, Wis., who furnished the stone, delivered on cars at the lock, all cut ready to lay in the work.

The courses of face stone are alternately 2 feet 8 inches and 1 foot 8 inches wide, and vary from  $13\frac{1}{2}$  to 22 inches in thickness with a coping  $17\frac{1}{2}$  inches thick by 4 feet 6 inches wide.

The backing was of rubble masonry composed of derrick rubble from the same quarry and of small rubble from the old lock walls. The walls are 9 feet wide on the bottom and 4 feet 6 inches wide on the top.

The upper wing walls were rebuilt with cement masonry, using old stone from the lock walls and the stone removed from the old wing wall, the left wing wall forming a wing to the waste weir. Beginning at a point 13 feet below the lower end of the right wall of the lock, the right wing wall is occupied by the Chicago and Northwestern Railway Company for a distance of 26 feet, as the right approach to their drawbridge. The railway company rebuilt this part of the wing wall of cement masonry. The space intervening between the approach and the lower end of the lock was filled in with cement masonry. Below this approach the wing wall was built of dry rubble.

The lower left wing wall was taken down and relaid in a straight line from the end of the lock wall to the corner of the center pier of the railway bridge, a distance of 53.6 feet, a dry wall being laid, which was pointed with cement.

*Valve platform.*—The valve platform was built in the same manner as previous locks, provided with modern butterfly valves operated by gearing on the lock wall and supported by a stone center pier and supports of extra strong gas pipe.

*Lock gates.*—The gates were entirely rebuilt solid of Oregon fir timber, with gas-pipe hand rails and steel gate spars, the necessary changes being made in the old tripods.

The lock walls were provided with cast-iron snubbing posts, and cast-iron cover-plates were provided for spar openings and back straps.

The plant used in rebuilding this wall was all on hand except the gravity concrete mixer, which was purchased and used for the first time for this work with good results.

Water was let into the lock April 25, 1903, and navigation was resumed on the 27th.

The lock proper was completed May 10, 1903, and grading finished June 30, 1903.

*Kaukauna first lock house and warehouse.*—The roof of main part of lock house was reshingled with cedar shingles.

The plastering in warehouse office was repaired and repapered. Clay was placed for filling depression around warehouse and the space between warehouse and first lock and covered with crushed stone.

*Kaukauna Canal bank.*—A roadway was graded and covered with crushed stone along the left bank of canal from the warehouse at first lock to dry dock, and at the same time the bank of canal was graded and sloped. Additional stone was added and surface graveled this spring.

*Little Chute combined locks.*—The lower and middle gates of this lock were replaced with solid gates of fir timber, using all the old ironwork that was available and the valve stems, gears, etc., removed from Kaukauna second lock and purchasing such ironwork as was necessary. The gates were completed and hung on April 28, 1903.

The bank below the lock was sloped and riprapped with stone taken from adjoining dredge bank.

The ground around tripod platforms was leveled up and the bank between lock and waste weir was graded and sloped.

*Little Chute second lock.*—The wooden frames for valve-maneuvering gear were removed.

*Cedars lock and lock house.*—The crib on left dredge bank below lock was straightened up and repaired.

A new hard-wood floor was laid in kitchen of lock house.

*Appleton fourth lock and lock house.*—A depression between house and lock was filled with clay and covered with black earth.

A new hard-wood floor was laid in kitchen, hall, and pantry of lock house.

*Appleton third lock house.*—A new hard-wood floor was laid in kitchen.

*Appleton first lock.*—New gate spars of steel were provided for this lock in place of the wooden spars; the necessary changes were made in the tripods and the spar openings in coping covered with cast-iron plates.

The crib above left head wall was removed to a height of 1 foot below crest of Appleton upper dam and rebuilt with large rubble masonry laid in cement.

*Grignon rapids crib.*—A new crib was built and placed to mark the channel at the head of dredge bank at Grignon rapids (1 mile above Appleton first lock), to take the place of the one that had been tipped over and destroyed.

*Menasha lock.*—The lower wing walls were extended 12 feet on either side of sinking timber cribs filled with stone level with the surface of water, upon which was built a superstructure of cement masonry 3 feet in height composed of derrick rubble, dressed to correspond with the balance of the wall. The space between the cribs and canal bank was filled and leveled with earth.

The joints in the wing walls were raked out and repointed with Portland cement mortar.

*Menasha lock house.*—The shed roof on the north wing was shingled with Eastlake tin shingles.

Slight repairs were made to the plastering of the kitchen ceiling.

*Menasha dam.*—A picket fence 10 feet in height, attached to and extended from the house on the left abutment to the side of the Howard paper mill, and provided with a double drive gate, secured with chain and padlock, was built to keep trespassers off the same.

*Eureka dam.*—Slight repairs were made to the fourth and fifth valves of the navigable pass.

Gravel was placed for filling depressions in the backing of the dam and for reinforcing the same.

*Eureka lock.*—The lower left wing wall was repaired by relaying a part of the wall in cement mortar. Both lower wing walls were repointed with Portland cement mortar.

*Eureka lock house.*—The chimney on kitchen was rebuilt above the roof; the tool house and outhouse were provided with new shingle roofs; the outhouse was raised, leveled, and provided with new sills and floor, and a new walk was laid to fountain house. Other minor repairs were made.

*White River lock.*—New solid fir timber gates were built for this lock, the timber for which was purchased and partly framed during the last fiscal year. The gates were provided with new steel T bars, plates, tie-rods, valve boxes, etc., and the balance of the old ironwork was refitted. Gas-pipe hand rails were substituted for the old wooden hand rails.

\* \* \* \* \*

The lock gates were painted. Slight repairs were made to the lower left wing wall by relaying a part of the wall in cement mortar and filling a depression in the bank behind the same with earth. Both lower wing walls were pointed with Portland cement mortar.

*White River lock.*—The shore protection below right abutment was repaired by building a dry wall 8 feet long immediately below the abutment. Below this wall the shore protection was raised 3 feet for a distance of 50 feet with brush and stone.

The right bank of river from head of canal toward dam for a distance of 290 feet was sloped and riprapped with stone, and willow slips were planted between the stones.

*White River lock house.*—A new hard-wood floor was laid in sitting room; a new screen door and 4 screen windows were purchased and fitted in place; new outside steps were made and placed at back of house; the plastering in sitting room was repaired; a new wooden cistern was purchased and placed and the pump platform and walk were repaired.

*Princeton lock.*—New solid fir timber gates were built for this lock, the timber for which was purchased and partly framed during the last fiscal year. The gates were provided with new steel plates, T bars, tie-rods, and valve boxes; old valve rods and shackle bars from the lower river were refitted for the upper gates. The balance of the ironwork was refitted. Gas-pipe hand rails were substituted for the old wooden hand rails; the gates were painted; snubbing posts of old oak timber were placed in bank above and below the lock.

*Princeton lock house.*—The roof of house was reshingled with Eastlake tin shingles.

*Grand River lock.*—The work of making repairs to the gates, miter sills, and floor of this lock, commenced during the last fiscal year, was completed. New solid fir timber gates were built for this lock, the timber for which was purchased and partly framed during the last fiscal year. The gates were provided with new steel T bars, plates, tie-rods, valve boxes, etc. The balance of the old ironwork was refitted.

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Gas-pipe hand rails were substituted for the old wooden hand rails. The lock was closed to navigation from July 1 to 16 for the purpose of making repairs to miter sills and platform. The lock was pumped out and the decayed timber in platform under upper sills and in upper recesses was replaced with 2-inch plank covered with 1-inch matched boards.

The upper miter sills being sound, but water worn, were trued up and faced with 2-inch plank and the sills rebolted with drift bolts. Snubbing posts of old oak timber were placed above and below the lock. The upper right wing crib was straightened up and repaired. The floor of lock was thoroughly cleaned. The stop timbers and dike were removed.

*Grand River fences.*—The fence around lock house was rebuilt with Elwood woven-wire fencing and provided with drive and walk gates. The fence along the boundary lines on the south and west sides was rebuilt, using new posts and the old barbed wire and that removed from lock-house fence; two drive gates were provided and placed. Slight repairs were made to the board fence along United States road to highway.

*Grand River waste weir.*—The waste weir opposite the mouth of Grand River was rebuilt with new timber and the cribs filled with stone taken from old crib.

*Montello dam.*—This dam was backed with gravel.

*Governor Ben lock.*—A tool house 12 feet square was built at Berlin lock and transported to this lock and placed on the upper end on the right side.

*Fort Winnebago lock.*—A tool house 12 feet square was built at Berlin lock and transported to this lock and placed on the lower end on the left side. The old shed at this lock was torn down and the material transported to Berlin.

*Protection of sand bank, upper Fox River.*—In order to prevent erosions and the consequent forming of bars below, sand banks on the upper river were protected in the manner named at the following places:

*At head of Maple Bend cut.*—A sand bank on the left side of the river above the cut was protected with piles, brush, and stone for a distance of 550 feet.

*At mouth of White River.*—A sand bank on the right side opposite the mouth of White River was protected with piles, brush, and stone for a distance of 550 feet.

*At State Center.*—A sand bank on the left side about one-fourth mile below mile-post 46 was protected with piles, brush, and stone for a distance of 835 feet.

### GENERAL REPAIRS OF LOCKS, DAMS, AND CANAL BANKS.

*Kaukauna fifth lock.*—The lower left gate, unseated by small stone, was replaced.

*Kaukauna third and fourth locks.*—Slight repairs were made to miter sills.

*Kaukauna Canal.*—The dredge bank on left side between third and fourth locks was leveled off; the canal bank on left side below first lock and on right side above first lock was riprapped with stone for a distance of 50 feet at either place.

*Kaukauna first lock.*—A fence was built along the "Blue Line" between the "Delbridge" property and that of the United States near the first lock.

*Kaukauna guard lock.*—The old fender piles were removed and a new fender crib 19 feet in length was built and sunk above the left head wall and 15 feet distant therefrom and connected to same with wale timbers.

*Little Chute canal bank.*—The right bank of canal, above Combined Locks, was raised with gravel and riprapped with stone for a distance of 50 feet. The right bank of canal below second lock was raised with earth and riprapped with stone for a distance of 75 feet. Earth was placed behind the lower end of right lock wall where it had been washed away.

*Little Chute second lock.*—The upper tripod platforms were leveled up and rebuilt.

*Appleton fourth lock.*—New fender plank were placed on upper gates.

*Appleton second lock house.*—A defective chimney was rebuilt.

*Appleton upper dam.*—A break occurred in this dam on March 19, 1903, near the left end, caused by leakage under capstone. The masonry was repaired and the dam reinforced with a timber crib, filled with stone, placed below the break. The masonry of dam was repointed with cement.

*Appleton channel.*—A guide crib was built and sunk on the left side of the channel opposite Lehman's landing above Appleton first lock.

*Menasha Canal.*—The old dump scow, sunk in basin above Menasha lock, was removed and placed on left bank of canal.

*Eureka lock.*—The right lower gate, which was damaged by a passing boat on August 20, 1902, was repaired and painted. The fender piles were whitewashed and the buildings at this lock were painted. The right bank of canal above lock was sloped and riprapped with stone for a distance of 450 feet.

*Berlin lock.*—The fender timbers at head of lock were painted and the piles and lower wing cribs were whitewashed.

A shed for storage of timber was built on the side of the timber shed.

A wood shed 12 by 24 feet was built near lock house and painted.

*White River lock house.*—The house was painted outside.

*Miscellaneous.*—Eight new mileposts were driven on upper river; 16 missing number boards replaced and 46 mileposts whitewashed.

## DREDGING BARS AND CHANNELS.

To maintain a navigable channel and restore it to dimensions heretofore obtained, and in maintaining a channel where projected depth had not been obtained, bars were removed on the upper and lower Fox River, as shown in the following tabulation.

*The following is a summary of the work done.*

Location.	Summary of cut.			Material (dipper measurement).		Character of material dredged.	Number of dredge working.
	Length.	Average width.	Average depth.	Handled.	Rehandled.		
	<i>Feet.</i>	<i>Feet.</i>	<i>Feet.</i>	<i>Cu. yds.</i>	<i>Cu. yds.</i>		
Between Kuakauna fourth and fifth locks.	1,870	15-25	1-2	2,691	742	Clay .....	4
Above Kaukauna first lock.....	1,725	25-40	1-2	3,249	900	.....do .....	4
Below Little Chute second lock.....	206	15	1-3	321	.....	.....do .....	4
Bar one-half mile above milepost 34.....	1,450	25-60	2-3	5,205	.....	Sand .....	5
Bar between mileposts 49-50 .....	6,110	25-60	1-3	21,762	4,962	Sand, clay, and stone.	4 and 5
Bar between mileposts 50-51 .....	2,540	25-60	1-4	14,123	720	Sand .....	4 and 5
Bar between mileposts 51-52 .....	3,200	25-35	2-2½	10,827	3,826	Sand and clay.	4
Bar between mileposts 53-54 .....	1,075	8-40	1-3	2,466	675	Sand .....	4
Bar between mileposts 54-55 .....	1,400	25-25	2-3	5,184	1,705	.....do .....	4
Bar between mileposts 55-56 .....	3,200	25-35	1-2½	10,557	3,596	(Clay, stone, and gravel.	4
At foot of Lake Apuckawa .....	1,780	30-60	1-3	9,954	.....	Clay, mud, and stone.	5
Bar one-half mile above milepost 73.....	360	60	3	2,502	.....	Sand .....	5
Bar at milepost 75 .....	320	60	1-3	1,884	.....	.....do .....	5
Bar one-half mile below milepost 76.....	440	60	1-4	2,928	.....	.....do .....	5
Bar at mouth of Montello River.....	600	60	2-4	3,939	300	Mud and clay.	5
Building and removing cofferdam at Grand River lock.....	.....	.....	.....	618	.....	.....	5
Building and removing cofferdam at White River lock.....	.....	.....	.....	966	.....	.....	5
Total .....	.....	.....	.....	102,766	17,426	.....	.....

The total amount of dredging done during the fiscal year was 102,776 cubic yards, dipper measurement, at an expense of \$3,746, or at the rate of 3.64 cents per cubic yard.

## SPECIAL REPAIRS TO PLANT.

*Dredge No. 4.*—A part of the top chord of the truss, the spud hoist, and the bolster were repaired, and a new dipper handle, the material for which was on hand, was framed and put in place.

*Dredge No. 5.*—New spuds were framed for this dredge, the timber for which was on hand, and the boom was replanked. A new 2-yard Lancaster grapple and a new Worthington boiler feed pump were purchased and placed on this dredge.

*Pile driver.*—New timber was purchased and partly framed for the pile driver and an engine house 12 by 18 feet was built on the pile-driver scow.

*New 50-foot scow.*—A flat scow, 50 feet long, 16 feet wide, and 3 feet deep, of Oregon fir timber, was built under contract by George Ryan, of Oshkosh. This scow is marked No. 6.

## GENERAL REPAIRS OF PLANT, BOATS, DREDGES, ETC.

*Steam tug Fox.*—A new canvas roof was put on the pilot house, skylight, and deck of upper cabin. This boat was laid up at Berlin lock November 29, 1902.

In March, 1903, a new Scotch marine boiler, with Morrison corrugated furnace, was built and placed in the boat.

Some slight repairs were made and the boat was painted. She went into commission on June 1, 1903.

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*Steam tug Wolf.*—This boat was laid up at Berlin lock November 29, 1902. In April, 1903, slight repairs were made to fire arch and to roof of main deck. She was put in commission on April 18, 1903.

*Dredge No. 4.*—This dredge was laid up on blocking in Kaukauna dry dock November 18, 1902. In April, 1903, slight repairs were made to the hull and she was calked where necessary. Two new spuds were provided, and three spuds provided with steel shoes, and a new extra dipper handle was framed and ironed. The upper works were painted inside and outside, and the hull was painted outside. She went into commission on May 16, 1903.

*Dredge No. 5.*—This dredge was laid up at Berlin lock November 11, 1902. In May, 1903, slight repairs were made to the hull and the machinery. The hull and upper works were painted. She was put into commission May 13.

*Barge Princeton.*—Repairs were made to rudder and a new spud was provided. The seams, where necessary, were hawsed, calked, and pitched.

*Fifty-foot scow No. 7.*—The seams in this scow were hawsed, calked, and pitched where necessary.

*Ames portable boiler No. 3 on wheels.*—The flues were expanded and calked.

*Ames portable boiler on skids.*—New skids were framed and placed.

Slight repairs were made to 80-foot flat scow No. 4 and open wood scow No. 1.

Respectfully submitted.

L. M. MANN,  
Assistant Engineer.

Maj. JAMES G. WARREN,  
Corps of Engineers.

OPERATING AND CARE OF CANALS AND OTHER WORKS OF NAVIGATION APPLIED TO FOX RIVER, WISCONSIN.

[Section 4 of river and harbor act of July 5, 1884.]

*Detailed statement of expenditures for fiscal year ending June 30, 1903.*

Character of work, etc.	Item of expense.	Amount.	Total.
Repairs of Depere dam.....	Labor.....		\$122.48
Repairs of Little Kaukauna dam.....	Materials.....	\$47.27	
Do.....	Labor and transportation.....	41.68	88.95
Repairs of Little Kaukauna dike.....	Materials.....	4.00	
Do.....	Labor and transportation.....	54.17	102.17
Repairs of Rapide Croche lock.....	Labor.....		302.67
Repairs of Kaukauna fifth lock.....	Materials.....	4.45	
Do.....	Labor.....	23.34	27.79
Rebuilding Kaukauna second lock.....	Materials.....	13,569.73	
Do.....	Labor and transportation.....	10,743.04	24,312.77
Repairs of Kaukauna first lock house.....	Materials.....	31.00	
Do.....	Labor.....	12.50	43.50
Repairs of Kaukauna warehouse.....	Materials.....	14.08	
Do.....	Labor.....	201.07	215.15
Repairs of Kaukauna Canal bank.....	do.....		308.48
Repairs of Little Chute combined locks.....	Materials.....	1,312.06	
Do.....	Labor and transportation.....	923.58	2,235.64
Repairs of Little Chute second lock.....	Labor.....		6.50
Repairs of Cedars lock house.....	Materials.....		7.82
Repairs of Appleton fourth lock and lock house.....	do.....	12.24	
Do.....	Labor.....	34.66	46.90
Repairs of Appleton third lock house.....	Materials.....		8.06
Repairs of Appleton first lock.....	do.....	402.90	
Do.....	Labor.....	242.19	645.09
Repairs of Grignon Rapids crib.....	Materials.....	80.14	
Do.....	Labor.....	51.75	131.89

# APPENDIX L I—REPORT OF MAJOR WARREN.

1879

*Detailed statement of expenditures for fiscal year ending June 30, 1903—Continued.*

Character of work, etc.	Item of expense.	Amount.	Total.
Repairs of Menasha lock .....	Materials .....	\$144.09	\$347.76
Do .....	Labor .....	203.67	
Repairs of Menasha lock house .....	Materials .....	9.20	16.70
Do .....	Labor .....	7.50	
Repairs of Menasha dam .....	Materials .....	10.08	24.08
Do .....	Labor .....	14.00	
Repairs of Eureka lock .....	Materials .....	15.85	51.85
Do .....	Labor and transportation ..	36.00	
Repairs of Eureka lock house .....	Materials .....	22.44	52.44
Do .....	Labor .....	30.00	
Repairs of Eureka dam .....	Materials .....	55.00	186.25
Do .....	Labor and transportation ..	131.25	
Sand bank at head of Maple Bend cut .....	Materials .....	138.88	307.24
Do .....	Labor .....	168.36	
Repairs of White River lock .....	Materials .....	29.40	990.89
Do .....	Labor and transportation ..	961.49	
Repairs of White River lock house .....	Materials .....	28.17	57.17
Do .....	Labor .....	29.00	
Sand bank at mouth of White River .....	Materials .....	138.87	327.87
Do .....	Labor .....	189.00	
Repairs of White River dam .....	Materials .....	63.25	100.75
Do .....	Labor .....	37.50	
Sand bank at State Center .....	Materials .....	199.00	370.12
Do .....	Labor .....	171.12	
Repairs of Princeton lock .....	Labor and transportation ..		515.77
Repairs of Princeton lock house .....	Materials .....	68.71	96.71
Do .....	Labor .....	28.00	
Repairs of Grand River lock .....	Materials .....	67.00	880.26
Do .....	Labor .....	813.26	
Repairs of Grand River waste weir .....	Materials .....	59.81	132.56
Do .....	Labor .....	72.75	
Repairs of fence at Grand River lock .....	Materials .....	157.31	239.81
Do .....	Labor .....	82.50	
Repairs of Montello dam .....	do .....		41.25
Repairs of Governor Bend lock .....	Materials .....	42.49	108.11
Do .....	Labor .....	65.62	
Repairs of Fort Winnebago lock .....	Materials .....	42.50	108.13
Do .....	Labor .....	65.63	
Repairs of Portage lock .....	do .....		335.63
Crib walls—Old Portage lock .....	do .....		82.00
Pile revetment—entrance to Portage lock .....	do .....		57.00
General repairs to locks, dams, and canal banks..	Materials .....	1,732.42	3,721.83
Do .....	Labor and transportation ..	1,511.41	
Do .....	Land at Montello lock site ..	478.00	4,317.51
Dredging bars and channels .....	Fuel, supplies, etc. ....	1,176.53	
Do .....	Labor .....	3,170.98	2,639.92
Special repairs to plant .....	Repairs to pile driver .....	134.34	
Do .....	Repairs of dredges Nos. 4 and 5 and pile driver ..	77.86	159.10
Do .....	Repairs of dredge No. 4 .....	183.37	
Do .....	Repairs of dredge No. 5 .....	1,354.25	2,639.92
Do .....	Flat scow No. 6 (50 foot) ..	890.00	
Repairs of boats and dredges .....	Repairs of tug Fox .....	3,137.80	159.10
Do .....	Repairs of tug Wolf .....	159.10	
Do .....	Repairs of scows Nos. 8 and 4 ..	129.55	713.19
Do .....	Repairs of dredge No. 4 .....	713.19	
Do .....	Repairs of dredge No. 5 .....	365.76	179.91
Do .....	Miscellaneous .....	179.91	
Do .....	Portable engine No. 3 .....	49.49	36.50
Do .....	Repairs of barge Princeton ..	36.50	
Do .....	Repairs of pile driver .....	23.96	4,792.76

# 1880 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

*Detailed statement of expenditures for fiscal year ending June 30, 1903—Continued.*

Character of work, etc.	Item of expense.	Amount.	Total.
Care of works and property .....	Watchmen, labor, and transportation.	\$1,608.46	
Do.....	Fuel for tugs Fox and Wolf.	212.94	
Do.....	Traveling expenses of assistant engineer, etc.	156.26	
Do.....	Subsistence.....	17.09	
Maintenance of navigation.....	Lockmasters' services.....	7,240.00	\$1,994.75
Do.....	Gauge observers' services...	60.00	
Superintendence and contingencies .....	Salary of assistant engineer.	2,400.00	7,300.00
Do.....	Salary of junior engineer ..	1,500.00	
Do.....	Salary of superintendent...	1,800.00	
Do.....	Salary of clerk .....	1,440.00	
Do.....	Salary of clerks, etc.....	1,106.00	
Do.....	Salary of messenger.....	469.33	
Do.....	Mileage of officers.....	59.81	
Do.....	Rent of office, Oshkosh.....	300.00	
Do.....	Rent of telephones and tolls	197.31	
Do.....	Oshkosh City Directory .....	5.00	
Do.....	Stationery.....	370.58	
Do.....	Rent of post-office box .....	2.25	
Do.....	Telegrams.....	.81	
			9,650.09
Total.....			68,482.59

L L 19.

## REPORT OF SURVEY OF MANITOWOC HARBOR AND RIVER, WISCONSIN.

UNITED STATES ENGINEER OFFICE,  
*Milwaukee, Wis., July 13, 1903.*

GENERAL: I have the honor to submit the following report of a survey of Manitowoc Harbor and River, together with a map of the survey and estimate of cost of the proposed improvement, in accordance with the requirements of an item in the river and harbor act approved June 13, 1902, making appropriation for Manitowoc Harbor, and which reads as follows:

Improving harbor at Manitowoc, Wisconsin: \* \* \* *Provided*, That the Secretary of War shall cause to be made a survey of Manitowoc Harbor and River, with an estimate of the cost of improving the same, so as to make the same more available as a harbor of refuge, by the construction of two or more turning basins in said Manitowoc River between the upper and lower bridges of the Wisconsin Central Railway Company, each of a depth of not less than twenty-one feet and of as great a width as is deemed feasible, together with a safe and convenient channel of sufficient width and not less than twenty-one feet in depth from the said turning basins to the entrance of Manitowoc Harbor.

Under date of June 28, 1900, a report on a preliminary examination of Manitowoc Harbor, with a view of making a harbor of refuge with a depth of not less than 20 feet, was submitted, and published in House Document No. 95, Fifty-sixth Congress, second session. It is believed that there has been no change in conditions since the date of said report, other than that the 400-foot extension to the breakwater mentioned in last paragraph of report, is now under contract and will be completed this season. Attention is therefore invited to that report.

On the map<sup>a</sup> accompanying this report, the locations of the proposed

<sup>a</sup> Not printed.



turning basins, two in number, are shown by dotted red circles, each representing a diameter of 450 feet. The harbor lines, established by authority of the Secretary of War February 11, 1896, are shown by full red lines and the boundaries of the proposed channel are shown by broken red lines.

In order to make practicable turning basins it will be necessary to modify the harbor lines in their vicinity, as the boundaries of the proposed turning basins intersect the harbor lines in places. The least width of the channel connecting the turning basins and the harbor entrance (except at bridges) is 150 feet, and this width has been increased at the bends in the river so as to permit the passage of large vessels.

The material to be dredged is believed to be principally mud and clay, and the estimated cost of dredging the proposed channel and turning basins to a depth of 21 feet below the established datum plane, and which is 581.28 feet above mean tide at New York City, is as follows:

Dredging 785,000 cubic yards mud and clay, at 12 cents.....	\$94, 200
Contingencies, superintendence, etc., 10 per cent .....	9, 420
Total .....	103, 620

The foregoing estimate does not include the cost of the land that would be required in constructing the proposed turning basins.

If the turning basins and connecting channels be dredged by the United States, as herein proposed, it is recommended that the work be done under the following conditions:

First. The city of Manitowoc to donate or cause to be donated to the United States all land that may be necessary for the formation of turning basins as herein provided.

Second. The city of Manitowoc to cause the turning basins to be properly revetted or docked, so as to prevent material from being washed into the basins from the sides. This work to be done under the supervision of the engineer officer in charge and to his satisfaction.

Third. That inasmuch as the sewage of the city of Manitowoc is discharged into the Manitowoc River, the city of Manitowoc shall do or cause to be done such dredging as may be necessary to maintain a depth of 21 feet below datum in channel and basins, after they shall have once been dredged to said depth of 21 feet by the United States.

Very respectfully, your obedient servant,

J. G. WARREN,  
*Major, Corps of Engineers.*

Brig. Gen. G. L. GILLESPIE,  
*Chief of Engineers, U. S. A.*

(Through the division engineer.)

[First indorsement.]

OFFICE DIVISION ENGINEER,  
NORTHWEST DIVISION,  
*Chicago, Ill., July 15, 1903.*

Respectfully forwarded to the Chief of Engineers.

An effective turning basin should have dimensions great enough to permit the turning of the largest lake vessels, and if its banks are to be used for commercial purposes, it should also be large enough to permit vessels to be moored along its shores. A least diameter of 650 feet is not excessive. The area should be much greater than that

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proposed by Major Warren, and the estimate of cost should be increased proportionately. An addition of 50 per cent to the estimate would perhaps be sufficient.

I concur in the recommendations contained in the sixth paragraph.

O. H. ERNST,  
*Colonel, Corps of Engineers,  
Division Engineer, Northwest Division.*

[Second indorsement.]

OFFICE CHIEF OF ENGINEERS,  
U. S. ARMY.  
*July 18, 1903.*

Respectfully referred to the Board of Engineers for Rivers and Harbors constituted by Special Orders, No. 24, Headquarters, Corps of Engineers, series of 1902, for consideration and recommendation.

A. MACKENZIE,  
*Acting Chief of Engineers.*

[Third indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS.  
*Washington, D. C., August 25, 1903.*

Respectfully returned to the Chief of Engineers, United States Army.

The Board of Engineers for Rivers and Harbors has considered the within report of the district officer of a survey of Manitowoc Harbor and River, the indorsement of the division engineer thereon, and other data available.

The act requires a survey of Manitowoc Harbor and River and an estimate of the cost of making the harbor of Manitowoc "more available as a harbor of refuge," and prescribes as the method to be used in so doing the provision of two turning basins, each 21 feet deep and "of as great width as is deemed feasible," and a channel 21 feet deep, extending from the upper turning basin to the lake.

If a harbor of refuge suitable for vessels of all sizes that frequent this port is to be provided, the only proper method is to build an off-shore breakwater or breakwaters, as has been done, for example, at Milwaukee. No matter what room might be provided in the river, entering vessels, particularly large vessels, would find the narrow entrance, with its piers, a menace in time of severe storms. The provision of turning basins in the river, no matter what their size, would not materially increase the value of this harbor as a harbor of refuge. Rather than risk the dangers of the present entrance large vessels would ride out a storm in the open lake, as they do at the present time.

At present the harbor is used to a limited extent as a place of shelter by vessels of small and medium sizes. The river in its present condition affords all the room needed by such vessels.

In view of the above, the Board is of opinion that it is not desirable for the United States to provide either the turning basins or the channel described in the act for the purpose of making the harbor of Manitowoc "more available as a harbor of refuge."

For the Board:

CHAS. J. ALLEN,  
*Lieut. Col., Corps of Engineers,  
Senior Member of the Board.*

[Fourth indorsement.]

OFFICE CHIEF OF ENGINEERS,  
U. S. ARMY,  
September 16, 1903.

The views of the Board of Engineers for Rivers and Harbors expressed in the preceding indorsement are concurred in.

G. L. GILLESPIE,  
*Brig. Gen., Chief of Engineers,*  
U. S. Army.

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L L 20.

ESTABLISHMENT OF HARBOR LINES ON THE SOUTH SHORE OF FOX RIVER BETWEEN MAIN AND LIGHT STREET BRIDGES, OSHKOSH, WISCONSIN.

UNITED STATES ENGINEER OFFICE,  
*Milwaukee, Wis., June 20, 1902.*

GENERAL: I have the honor to forward herewith an application, addressed to the Secretary of War, for the establishment of a harbor line along the south shore of the Fox River between Main and Light Street bridges, at Oshkosh, Wis. The application is made by the owners of the property on this line and is accompanied by blueprint plan and description.<sup>a</sup>

The proposed line is an extension of that approved by the Secretary of War at the request of Chicago and Northwestern Railway Company September 21, 1898.

I have examined the plans and the locality and am of opinion that the establishment of the proposed line will be in the interest of navigation as well as that of the property owners. The application is therefore recommended for approval.

Very respectfully, your obedient servant,

J. G. WARREN,  
*Major, Corps of Engineers.*

Brig. Gen. G. L. GILLESPIE,  
*Chief of Engineers, U. S. A.*

[Fifth indorsement.]

OFFICE CHIEF OF ENGINEERS,  
U. S. ARMY,  
July 29, 1902.

Respectfully submitted to the Secretary of War.

Request is made by certain adjoining property owners for the establishment of harbor lines on the south shore of Fox River between Main and Light Street bridges, Oshkosh, Wis.

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<sup>a</sup> Not printed.

1884 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

Inviting attention to the within report by the local engineer officer, it is recommended that the lines delineated and described on the accompanying tracing<sup>a</sup> be approved.

A. MACKENZIE,  
*Acting Chief of Engineers.*

[Sixth indorsement.]

WAR DEPARTMENT,  
*August 1, 1902.*

Approved as recommended by the Acting Chief of Engineers.

W. SANGER,  
*Acting Secretary of War.*

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L L 21.

MODIFICATION OF HARBOR LINES IN FOX RIVER AT GREEN BAY, WISCONSIN.

CHICAGO, MILWAUKEE AND ST. PAUL RAILWAY CO.,  
OFFICE OF THE PRESIDENT,  
*Chicago, March 27, 1903.*

DEAR SIR: This company respectfully petitions you to approve of a modification of the dock line in front of a portion of its property along the east side of Fox River in the city of Green Bay, Wis., as shown and described upon the accompanying tracing.<sup>a</sup>

This company proposes the construction of a new dock at this point, to be equipped with a modern system of coal-handling machinery; and the present width of the property does not admit of the economical construction of the new dock, nor of one of the desired capacity, and for this reason it is desired to extend the dock line as indicated. You will note that the proposed change is entirely within the limits of river frontage owned by this company.

It is the desire to complete the dock so that it may be put into service as early this coming season as practicable, and I would, therefore, very much appreciate an early consideration of this matter.

Yours, truly,

A. J. EARLING, *President.*

The SECRETARY OF WAR,  
*Washington, D. C.*

[Second indorsement.]

OFFICE CHIEF OF ENGINEERS,  
U. S. ARMY,  
*April 1, 1903.*

Respectfully referred to Maj. J. G. Warren, Corps of Engineers, for report.

To be returned.

By command of Brig. Gen. Gillespie:

A. MACKENZIE,  
*Colonel, Corps of Engineers.*

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<sup>a</sup> Not printed.

[Third indorsement.]

U. S. ENGINEER OFFICE,  
*Milwaukee, Wis., April 11, 1903.*

Respectfully returned to the Chief of Engineers, United States Army.

The proposed change in the harbor line at Green Bay, Wis., as herein requested, has been carefully considered. The Chicago, Milwaukee and St. Paul Railway Company's application was made after consultation with me.

The facts are as stated by the railway company, and I can see no objection to the proposed change, which is therefore recommended for favorable consideration.

J. G. WARREN,  
*Major, Corps of Engineers.*

[Fourth indorsement.]

OFFICE CHIEF OF ENGINEERS,  
U. S. ARMY,  
*April 16, 1903.*

Respectfully returned to the Secretary of War.

The Chicago, Milwaukee and St. Paul Railway Company requests a modification of the established harbor line in front of a portion of its property on the east side of Fox River in the city of Green Bay, Wis.

Inviting attention to report by the local officer in the preceding indorsement, from which it appears that there is no objection to the proposed change, I recommend that the company's request be granted and that the Secretary's approval be placed upon the accompanying tracing,<sup>a</sup> which has been prepared for his signature.

G. L. GILLESPIE,  
*Brig. Gen., Chief of Engineers,*  
*U. S. Army.*

NOTE.—The lines referred to above and shown on the map mentioned were approved by the Assistant Secretary of War under date of April 18, 1903, the approval being indicated on the map.

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<sup>a</sup> Not printed.



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